SIMON CLEAR & ASSOCIATES
PLANNING AND DEVELOPMENT
CONSULTANTS

# Environmental Impact Assessment Report

# Proposed Strategic Housing Development
at
Ballymany, Newbridge,
Co. Kildare

**Applicant: Briargate Developments Newbridge Limited**

**February 2022**

3 TERENURE ROAD WEST,
TERENURE,
DUBLIN 6W
D6W YY79,
IRELAND.

Phone: 00-353-1-492 5934
Fax: 00-353-1-492 7617
E-mail:
admin@clearconsult.ie
Web: www.clearconsult.ie
Vat No. 9803199H

Simon Clear B.A. Dip. T.P. MIPI

Darran Quaile B.A. MRUP MSc BLUP MIPI

Paula Shannon B.A. MRUP MIPI

## TABLE OF CONTENTS

## NON-TECHNICAL SUMMARY

This Environmental Impact Assessment Report (EIAR) has been prepared on behalf of the applicant, Briargate Developments Newbridge Limited, in association with the submission of a planning application to An Bord Pleanala, for a Strategic Housing Development at Ballymany, Newbridge, Co. Kildare.

### Site Location and Context

The development site is located on the southwestern edge of the built-up area of Newbridge, Co. Kildare in the townland of Ballymany. The site is c.1.5km south west of Newbridge town centre and c.700m north east of the M7 motorway interchange (junction 12) with Ballymany Road (R445). The site forms part of a larger landholding, for which permission was granted for residential development and a nursing home (KCC Ref. 16/658, ABP 249038).

Standhouse Road and a number of individual residential dwellings are located along the northern boundary of the site. The northern section of proposed development site was formerly in agricultural use (tillage) and the southern part was previously used for permitted sand and gravel extraction.

**Context Map (Source: www.geohive.ie – Annotated by SCA)**

The south eastern boundary of the site is occupied by construction works for residential development (ABP Ref. 249038) extending to the R445 road, a regional road linking the M7 to Newbridge. The construction works are proceeding under the provisions of a 10-year planning permission granted by An Bord Pleanala in 2018. The main vehicular access to the site will be provided by a residential road under construction, which has a junction with the R445, Ballymany Road. The R445 is also a bus route in Newbridge.

The secondary access will be from a new junction on the Standhouse Road (L7037). Standhouse Road runs in an east-west alignment along the northern boundary. It will be improved along the site frontage with a new junction and footpath provision to link to the existing footpath leading east towards Newbridge train station.

**View looking East along Standhouse Road with the construction works for the road evident to the right of the image**

Part of the eastern boundary adjoins an existing low-density residential estate development, The Elms and Scoil Mhuire Senior School abuts the northeastern boundary. The entire western boundary adjoins the mature landscape of the treelined Ballymany studfarm field enclosures.

The subject site outlined in red has a gross site area of 11.4ha and a nett site area of 9.61ha.

## Description of Development and Alternatives Considered

The proposed Strategic Housing Development will consist of future phases of a residential development (Curragh Farm development) of which Phase 1 (54 no. units and Link Road) is currently under construction on foot of planning Ref. 16/658 (ABP Ref. PL09.249038), which provided for 280 dwelling units, creche, nursing home and Link Road.

The overall development will provide 390 no. units and creche on completion.

The proposed SHD residential development with creche will consist of the following:-

- Construction of 336 no. residential units consisting of 245 no. houses, 27 no. apartments and 64 no. duplexes;
- The 245 no. houses will comprise 2-storey, detached, semi-detached and terraced units to include:-
    - 17 no. 2-bed houses;
    - 184 no. 3-bed houses;
    - 44 no. 4-bed houses;
- The 27 no. apartments are located in a part 3-storey and part 4-storey building and include:-
    - 13 no. 1-bed units;

  - 13 no. 2-bed units;
  - 1 no. 3-bed unit;
- The 64 no. duplexes are located across 6 no. 2 to 3-storey buildings and include:-
  - 32 no. 1-bed units;
  - 16 no. 2-bed units;
  - 16 no. 3-bed units;
  - A 2-storey creche;
- Car parking, bicycle parking, internal roads, services infrastructure, bin stores and bicycle stores;
- Footpath improvements along Standhouse Road;
- Landscaping, open spaces, play areas, boundary treatment and public lighting;
- All associated site works and services.

The key development statistics for the proposal are outlined in the Table below.

**Key Development Statistics**

| ***Site Statistics*** | |
|---|---|
| Site Area | 11.4 hectares |
| Net Site Area | 9.61 hectares |
| Number of Units | 336 |
| Density | 35 units per hectare |
| Plot Ratio | 0.3 |
| Site Coverage | 17% |
| Open Space | 17,626m$^2$ (15.4%) |
| ***Gross Areas m$^2$*** | |
| Gross Floor Area | 34,799.95 |
| Residential | 34,183.95 |
| Non-Residential | 616 |
| ***Residential Accommodation unit nos. (%)*** | |
| 1-bedroom | 45 (13.3%) |
| 2-bedroom | 46 (13.7%) |
| 3-bedroom | 201 (60%) |
| 4-bedroom | 44 (13%) |
| ***Commercial Accommodation m$^2$*** | |
| Creche | 616 |
| ***Open Space m$^2$*** | |
| Public Open Space | 17,626 |
| ***Parking*** | |
| Car parking spaces | 617 + 3 drop off |
| Cycle parking spaces | 146 |

Overall the proposal provides 336 no. residential units consisting of 245 no. houses, 27 no. apartments and 64 no. duplexes. The entire development consists of 45 no. 1-bed units, 46 no. 2-bed units, 201 no. 3-bed units and 44 no. 4-bed units.

The 2-storey creche is provided towards the centre of the site, adjacent an area of open space and is easily accessible from the Link Road. The creche has an area of 616m$^2$ and an outdoor play space with an area of 320m$^2$. The creche can provide up to 102 no. childcare spaces.

The facility has been designed to provide sufficient capacity to cater for any childcare demand arising from the development of the overall landholding, including the 54 no. units under construction in Phase 1.

A comprehensive and integrated open space design, which works with the proposed built fabric and circulation through the scheme has been created in consultation with the Parks Department of Kildare County Council.

Homezones are included to provide a safe movement environment with an animated streetscape, dedicated play areas and larger open spaces. There are 6 no. large areas of public open space throughout the site with further areas of open space provided to the west of the Link Road.

The existing topography of the site has been considered to ensure integration of useable open spaces within the site boundaries and integrating with the Phase 1 open space and movement proposals.

It is proposed that the development of the overall site will be broken down into 7 no. phases. Phase 1 (54 no. units) is currently under construction and the subject proposal will consist of phase 2-7. The following is a breakdown of the proposed development in each phase:-

- Phase 2: 56 no. dwellings and creche facility
- Phase 3: 88 no. dwellings and public open space (0.4ha)
- Phase 4: 93 no. dwellings and public open space (0.08ha)
- Phase 5: 38 no. dwellings and public open space (0.4ha)
- Phase 6: 34 no. dwellings
- Phase 7: 27 no. dwellings and public open space (0.3ha)

An Outline Construction Management Plan (OCMP)has been prepared by MAL and is included with the planning application. The plan sets out a framework of measures to address the implications of the construction works. In the event of a grant of permission, the appointed contractor(s) will update the OCMP to comply with and implement the requirements and mitigation and monitoring measures set out in this EIAR and any conditions imposed as part of the granted planning approval.

Subject to a successful grant of planning permission, it is intended that the works will commence in late 2022. The proposed development is anticipated to be constructed over a period of 36 months.

It is anticipated that for the duration of the works all access and egress to the site for construction related activities will be via either Ballymany Road or Standhouse Road.

As the project is supported by planning policy at national, regional and county levels, alternative locations were not considered.

Alternative designs considered include the permitted development as well as a number of iterations of the site layout. The evolution towards the final layout involved revisions to improve the quality of public amenity space, creation of a protective buffer for potential archaeological features, improvement of roads and footpaths and provision of a larger creche. The final design is considered to be the most favourable, particularly in respect of Population & Human Health, Cultural Heritage and Material Assets (Roads & Traffic).

## Population and Human Health

During construction, the main likely significant effects are a positive impact on employment and indirect employment generated in the local economy as a result of the multiplier effect.

During construction, the proposed development will cause loss of amenity, disruption and inconvenience to local residents and the nearest receptors. However, this impact will be temporary in nature and mitigated insofar as practicable through the Contractor's Construction Management Plan (CMP). The CMP will implement the requirements and mitigation and monitoring measures set out in this EIAR and any conditions attached to a grant of planning. A Community Liaison Officer (CLO) will be appointed and will inform the public of site operations and be available to local residents / members of the public with concerns / complaints.

The potential impacts relating to air quality, noise and vibration and transport are addressed in Chapters 8, 9 and 12 of this EIAR. Subject to adherence to best practice construction health and safety procedures, no significant adverse effects on human health are anticipated during the construction of this development.

During the operational phase, the proposal will have a long term significant and positive effects arising from the delivery of high quality homes and strategic road infrastructure.

In the operational stage, measures to address health and safety considerations, including risks of fire, flooding and universal access have been addressed as part of design mitigation and will be subject to the relevant regulations to ensure no significant adverse impacts on human health.

Impacts of the proposed development in terms of daylight/ sunlight and overshadowing have also been examined in detail in tandem with the scheme design and no significant impacts are anticipated.

No significant impacts are expected on human health as a result of the risk or vulnerability to major accidents or disasters.

## Biodiversity

This Biodiversity chapter has been prepared on behalf of and for the exclusive use of Briargate Developments Newbridge Limited by Panther Environmental Solutions Ltd, with respect to a Strategic Housing Development application to An Bord Pleanala for the development of a residential housing estate along with all associated works at Ballymany, Newbridge, Co. Kildare.

Dr Ross Donnelly-Swift of Panther Environmental Solutions Ltd compiled the chapter.

A Natura Impact Statement (NIS) has also been prepared in support of this report. The NIS report identified the presence of European sites within the potential zone of influence of the proposed development and noted that the proposed development site is hydrologically connected to the Pollardstown Fen SAC (Site Code 000396) and the River Barrow and River Nore SAC. It also in proximity to Mouds Bog SAC (Site Code 002331). The potential for impacts to European sites as a result of the proposed development such as potential surface water quality impacts, introduction of invasive species, habitat destruction and impacts from noise and dust were considered and the level of risk posed assessed. It is not anticipated that the proposed development, by itself or in combination with other developments, would impact negatively upon the Natura 2000 network during the construction or operational phases of the project.

The site is not anticipated to have a significant negative ecological impact upon the flora and fauna of the area, given the location and footprint of the development and given that habitats within the proposed development area are generally of either low ecological value or common to the area.

No mature trees will be removed as part of this development. The removal of any hedgerow would not take place during the bird nesting season (1st March to the 31st August). If hedgerows must be removed during the bird nesting season than a suitably qualified ecologist would be engaged to carry out inspections for the presence of breeding birds prior to any clearance works taking place. Where nests are present, the ecologist would make a decision as to whether a "*Licence to interfere with or destroy the breeding places of any wild animals*", is required from the NPWS. Alternatively, the ecologist may establish a suitable buffer zone around an active nest, with removal works rescheduled until chicks have fledged. Where no evidence of nests is found during inspection, hedgerow removal works must be undertaken within three days of inspection.

No rare or protected flora or fauna were recorded within the proposed development site during the site assessment. A disused badger sett was noted along the mature treeline with mitigation measures to prevent any potential disturbance of badgers during the construction phase. Bats were observed foraging along the mature treeline however these trees are outside the site boundary. Mitigations measures for both the construction and operation phase have been outlined to prevent disturbance to bats. Where protected species, such as badger are found during the construction phase of the project, an officer of the NPWS would be notified prior to the resumption of activities.

No invasive flora species of concern were noted as present for the proposed development area during the site assessment. Given the nature of the proposed development, it is considered that there would be no risk of introducing invasive species during the operational phase. The potential risk of introducing invasive species during the construction phase would be considered low.

The proposed development is not anticipated to have a significant ecological impact to flora and fauna due to a deterioration in water quality. There is no aquatic habitat of note within the site boundary. In addition, during both the construction and operational phase of the development mitigation measures will be implemented to prevent any impact on water quality.

While there would be increased noise emissions during the construction phase of the development along the rising main route, these would not be considered to pose a significant risk owing to the transient nature of works and given that all vehicles where possible would be equipped with mufflers to suppress noise, as is standard practice.

During the construction phase of the development, there would be potential for dust emissions. However, dust emissions would not be considered to have a significant potential impact on fauna due to the transient nature of construction works and the implementation of dust control measures.

Due to proposed mitigation measures, it is considered that the proposed development will not result in any significant adverse impacts to any protected species or habitats. These mitigation measures are highlighted below in **section 5.6.**

It is the conclusion of this assessment that the mitigation measures identified in the below report will be sufficient so as to prevent any adverse impacts on protected species or habitats from the proposed development.

### Land, Soil & Geology

This chapter of the Environmental Impact Assessment Report has been prepared by Muir Associates, Consulting Engineers and deals with the topics of Land, Soils and Geology and examines the potential impacts of the proposed development in the context of these topics.

The potential impacts identified with the construction phase of the proposed development is the excavation, handling, storage, processing and transport of earthworks materials. The impact to soils and geology are considered to be Minor and short term in nature.

The potential impacts identified with the operational phase of the proposed development is the contamination of the soils and geology as a result of hydrocarbon leaks from vehicular traffic which could potentially leak into the ground via the surface water drainage network. Such incidents have the potential to have a significant temporary impact.

However, it is likely that, with the implementation of the mitigation measures described above, the predicted impact of the construction and operational phases of the proposed development will be Imperceptible.

### Hydrology & Water

This chapter of the Environmental Impact Assessment Report has been prepared by Muir Associates, Consulting Engineers and deals with the topics of Hydrology and Water and examines the potential impacts of the proposed development in the context of these topics.

The potential impacts identified during the construction phase of the proposed development is the risk of pollution of surface water and groundwater due to elevated silt load as a result of construction activities and hydrocarbons entering the surface water system as a result of an accidental spillage. Such incidents have the potential to have a significant temporary impact.

The main potential impact identified on surface water and ground water quality during the operational phase of the proposed development is the accidental spillage of oil or the lack of proper maintenance of the installed drainage systems. Such incidents have the potential to have a significant temporary impact.

However, it is likely that, with the implementation of the mitigation measures described above, the residual impact of the construction phase will be short-term but not significant and the impact of the operational phase of the proposed development will be long term but will not be significant.

## Air Quality & Climate

This Air Quality and Climate chapter has been prepared on behalf of and for the exclusive use of Briargate Developments Newbridge Limited by Panther Environmental Solutions Ltd, with respect to a Strategic Housing Development application to An Bord Pleanala for the development of a residential housing estate along with all associated works at Ballymany, Newbridge, Co. Kildare.

Mr Martin O' Looney and Mr. Tom Madden of Panther Environmental Solutions Ltd compiled the following report.

Baseline monitoring data was obtained from EPA Air Quality Report 2020 which hold the relevant data which was required for the successful completion of this chapter. In order to determine the potential impact of the construction and operational phases of the development on air quality and climate, baseline date was obtained from the nearest relevant air quality monitoring sites to Ballymany, Newbridge, Co. Kildare.

The overall potential impact, pre mitigation, on the existing air quality at the nearest receptors during the construction phase is predicted to be of a moderate - major negative impact as a result of an assessment carried out in line with the National Road Authority Guidance *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (2011).*

The assessment has found that there are a number of sensitive receptors within distances of the proposed development site which could potentially be moderately/majorly affected by soiling, PM10 and impacts to vegetation. These impacts will be temporary and occur mainly during the initial site clearance work and preliminary build.

It should be noted that the predicted dust levels are very much a worst-case scenario and assume all activities are taking place simultaneously at the nearest point of the construction phase boundary to the relevant residential receptor.

It is not anticipated that the proposed development will significantly adversely affect air quality or climate during both the construction and operation phases.

Due to proposed mitigation measures, it is considered that the proposed development will not result in any significant adverse impacts to air quality in the area. These mitigation measures are highlighted below in **section 8.7** and in the Construction Management Plan.

It is the conclusion of this assessment that the mitigation measures identified in the below report will be sufficient so as to prevent any adverse impacts on air quality or climate from the proposed development site upon sensitive receptors in the area.

**Noise & Vibration**

This Noise & Vibration chapter has been prepared on behalf of and for the exclusive use of Briargate Developments Newbridge Limited by Panther Environmental Solutions Ltd, with respect to a Strategic Housing Development application to An Bord Pleanala for the development of a residential housing estate along with all associated works at Ballymany, Newbridge, Co. Kildare.

Mr Martin O' Looney and Mr. Tom Madden of Panther Environmental Solutions Ltd compiled the following chapter.

Baseline monitoring data was obtained from a previous Noise Impact Assessment conducted by Noel Tynan of Decibel Noise Control. Noise monitoring for the Decibel Noise Control report was undertaken from 18:00pm on Wednesday 7th April to 16:55pm Sunday 11th April 2021.

This chapter presents the findings of this assessment and provides a predictive assessment of the impact of the construction and operation of the proposed development on noise sensitive receptors (NSR's) to determine the need for any mitigation measures.

In order to determine the potential impact of noise from the construction and operational phases of the development, predicted noise levels at the nearest noise sensitive receptors surrounding the site were calculated in accordance with the methodology prescribed in ISO 9613-2:1996 '*Attenuation of Sound during Propagation Outdoors*'. The resultant predicted noise levels have been assessed in accordance with the methodology prescribed in BS 4142:2014 '*Methods for Rating and Assessing Industrial and Commercial Sound*'.

Resultant noise levels from the construction phase at the closest noise sensitive receptors to the proposed site boundary are expected to exceed the NRA 2014 guidance for Weekday and Saturday construction noise limits, with the exception of NSR3 and NSR4. It is concluded that the proposed development would have **a moderate impact, for limited periods of time,** on the closest local residences within the vicinity during **the construction phase.**

Noise levels at NSR1 are expected to **exceed** both the **NRA weekday limit of 70 dBA** and the **Saturday limit of 65 dBA**. Noise levels at NSR2 are expected to **exceed** the **NRA Saturday limit of 65 dBA only**. NSR2 is located along the site's eastern boundary in line with a number of other residential dwellings which are all within the same distance of the proposed development site boundary.

It should be noted that the predicted noise levels are very much a worst-case scenario and assume all activities are taking place simultaneously at the nearest point of the construction phase boundary to the relevant residential receptor.

As a result of the baseline noise survey, it is concluded that the proposed development would have **no significant impact** upon the existing noise environment of the area during the **operational phase**.

There would be a **moderate noise impact**, for **limited periods of time**, to noise sensitive receptors along the northern and eastern boundary's, as a result of the **construction phase only**, of the proposed development. However, if the mitigation measures which are identified below are implemented at the site during the construction phase, then it is not anticipated that there would be an adverse impact on local noise sensitive receptors.

Mitigation measures have been made with regard to the construction and operational phase of the development in order to ensure compliant noise levels at the proposed development site.

Due to the nature of construction and operational phases which will be carried out at the site, it is not anticipated that there will be significant vibration impacts on nearby sensitive receptors.

It is the conclusion of this assessment that the mitigation measures identified in the below report will be sufficient so as to prevent any adverse impacts from noise or vibration from the proposed development site upon sensitive receptors in the area.

## Landscape & Visual Impact Assessment

This chapter has been prepared by Jane McCorkell Landscape Architect, and provides an assessment of the Landscape and Visual Impact (LVIA) of the proposed development at Ballymany, Newbridge, Co. Kildare.

The objective of this assessment is to demonstrate how the proposed development would sit within its physical landscape. It summarizes the impact of the proposed development on the landscape character, the visual amenity of the current site, and the adjoining environs. These are considered in the context of the sites proximity to Newbridge town, the Curragh (Natural Heritage Area) and Pollardstown Fen (SCA). A review of relevant planning policy is also provided as a basis for this assessment. An outline of the methodology utilised to assess the impacts and describe the receiving environment (baseline) and its potential impacts of the development is included.

A description of the site and surrounding lands demonstrate the landscape character and assist in assessing its visibility from significant viewpoints in the locality. This has been demonstrated through photomontages to give a perspective of how the proposed development would appear from several vantage points. The description of each viewpoint, along with consideration of mitigation measures to offset or ameliorate impacts are considered and the resultant predicted impacts are outlines.

## Cultural Heritage

Cultural Heritage is assumed to include all humanly created features on the landscape, including portable artefacts, which might reflect the prehistoric, historic, architectural, engineering and/or social history of the area. Where appropriate, it also includes for non-physical aspects of heritage, such as history, linguistics, folklore, etc. The Cultural Heritage of the area of the proposed development was examined through an Archaeological, Architectural, and Historical study. The Archaeological and Architectural studies involved documentary, historic cartographic and aerial photographic research, focussed field inspection/surface reconnaissance survey and a programme of archaeological testing, while the Historical study involved documentary research.

The subject proposed development lands form parts of the townland and civil parish of Ballymany, in the barony of Offaly East. There are a number of possibilities for the origin of the name of Ballymany, including *Baile Meadhonach* – 'middle town;' *Baile Mháine* – 'Maine's town' or possibly *Baile na Manaigh* – 'town of the monks'. The latter does not necessarily mean that there was a monastery there but that the lands may have been owned by a monastery, probably Great Connell, and worked by lay tenants.

There are no significant historical events associated with the subject development area which have the ability to be impacted upon by the construction, and subsequent operation, of the proposed development. Consequently, no mitigation measures are deemed necessary.

The overall landholding comprises an area of 15.12 hectares, with the subject application area comprising 11.4ha. The land is not level with an overall fall in level from the southeast to the north west but there is great variation in levels arising from previous sand and gravel extractive workings on the site. The site currently has a number of gravel stockpiles, particularly in the central eastern area of the site, and in this and the southern area the original ground levels have been reduced into geological derived sands and gravels; the northern area is under rough grass and is relatively undisturbed except for a number of soil mounds and surface rutting. Archaeological investigations within the undisturbed south-western area of the northern site area have uncovered a cluster of eleven subsurface archaeological features of significant archaeological interest. The cluster of eleven archaeological features will be located within a proposed green/public space area and preserved 'in-situ' and a minimum 5m buffer area around the subsurface archaeological remains will be permanently established. Consequently, it is not envisaged that these will be impacted by the development. However, there is potential for further archaeological remains to be uncovered within the northern area of the site and it is suggested that all topsoil stripping in this area be monitored by an archaeologist; in the event that additional subsurface archaeological remains are encountered, then these can be dealt with in an appropriate manner. There are no predicted impacts with respect to Archaeological Heritage at the post-construction/operational phases of the proposed development.

There are no structures listed in the Record of Protected Structures (RPS) of the Kildare County Development Plan 2017-2023, the Newbridge Local Area Plan 2013-2019 or by the National Inventory of Architectural Heritage (NIAH) as being located within, or in the immediate environs of, the subject proposed development lands. Consequently, it is considered that there are no predicted impacts with respect to Architectural Heritage with regard to the proposed construction and post-construction/operational phases of the development. Consequently it is considered that no mitigation measures are required.

## Material Assets

### *Built Services*

The potential impacts identified in respect of Built Services during the construction phase of the proposed development include the proposal to underground any remaining overhead cables which are on the site. This will have a long term positive impact.

There will be a requirement for an electricity supply during the construction phase of the proposed development and the potential impact of the proposed development on the local electrical supply network is likely to be short-term and not significant.

The water supply network will experience an increase in demand due to the use of the facilities by construction staff. While such an increase will have a negative impact, it will be imperceptible and will be short-term in nature. The existing wastewater network will experience an increase in discharge due to the use of the facilities by construction staff. While such an increase will have a negative impact, it will be imperceptible and will be short-term in nature.

The potential impacts of the identified in respect of Built Services during the operational phase of the proposed development include the impact on the telecoms network which is likely to be long term and not significant.

The potential impact of the operational phase of the proposed development on the electricity supply network will be an increase in the demand on the existing electricity supply which is likely to be long term and slight.

The proposed development will result in an increase in peak water demand and the increase will result in a minor long-term negative impact on the existing water supply network. The impact on the existing wastewater network will result in a minor negative impact on the existing wastewater drainage network.

It is likely that, with the implementation of the mitigation measures described above, the residual impact of the construction phase will be short-term but imperceptible and the impact of the operational phase of the proposed development will be long term but will not be significant.

### *Roads and Traffic*

During the construction phase of the proposed development there will be increased vehicular movements associated with construction traffic and there may also be an increase in noise, and potentially dust, generated from construction related traffic. Such impacts will be short-term and not significant.

The potential impacts during the operational phase of the proposed development identified that the Standhouse Road will continue to operate within capacity for each of the assessment years and that the Ballymany Road currently operates above capacity and will continue to do so for each of the assessment years with and without the development.

With the implementation of the mitigation measures proposed there should be a slight short-term impact on the surrounding road network during the construction phase of the proposed development.

There will be an increase in traffic on the surrounding road network following the completion of the proposed development, however the traffic analyses undertaken demonstrates that there is sufficient capacity within the existing road network to accommodate this increase and the related impact will be long-term and slight. The delivery of the section of the link road from the L7042 Green Road to the L7037 Standhouse Road will have a long term positive impact.

### *Waste Management*

The potential effect of construction waste generated from the proposed development is considered to be short-term, and not significant.

The potential impact of operational waste generation from the development is considered to be long-term and not significant.

The implementation of the mitigation measures outlined above will ensure that a high rate of reuse, recovery and recycling is achieved at the development during the construction phase as well as during the operational phase.

# 1. INTRODUCTION & METHODOLOGY

## 1.1 Purpose of the EIAR

This Environmental Impact Assessment Report (EIAR) has been prepared on behalf of the applicant, Briargate Developments Newbridge Limited, in respect of an application for a Strategic Housing Development (SHD) on a site at Ballymany, Newbridge, Co. Kildare.

The purpose of the EIAR is to provide the Competent Authority (CA) undertaking the Environmental Impact Assessment (EIA) with information on the likely and significant effects, if any, that the proposed development, if carried out, would have on the environment.

## 1.2 Outline Details

The 11.4 hectare site is located at Ballymany in the western environs of Newbridge and is bounded to the north by Standhouse Road and the rear of dwellings fronting that road; to the south by Ballymany Road (R445) and Phase 1 of the Curragh Farm development; to the east by the gardens of houses in the Elms housing development and a playing field; and to the west by agricultural fields of Ballymany Studfarm.

**Figure 1.1: Context Map (Source: www.geohive.ie – Annotated by SCA)**

The development will consist of future phases of a residential development of which Phase 1 (54 no. units and Link Road) is currently under construction on foot of planning Ref. 16/658 (ABP Ref. PL09.249038), which planning permission provided for 280 dwelling units, creche, nursing home and Link Road. The overall development, Phase 1 plus the development described in the planning application will provide 390 no. units and creche on completion.

The proposed SHD residential development will consist of the following:-
- Construction of 336 no. residential units consisting of 245 no. houses, 27 no. apartments and 64 no. duplexes;
- A 2-storey creche;
- Car parking, bicycle parking, internal roads, services infrastructure, bin stores and bicycle stores;
- Footpath improvements along Standhouse Road;
- Landscaping, open spaces, play areas, boundary treatment and public lighting;
- All associated site works and services.

## 1.3 EIA Legislation & Guidelines

This EIAR has been prepared in accordance with EIA Legislation, specifically European Union **Directive 2014/52/EU** (the 2014 Directive), which amends Directive 2011/92/EU. The 2014 Directive is transposed into Irish land use planning law by the *European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018* (the 2018 Regulations). The 2018 Regulations amend both the Planning & Development Act 2000 (as amended) and the Planning & Development Regulations 2001 (as amended).

This EIAR has been prepared in accordance with the 2014 Directive, the 2018 Regulations and relevant Guidelines including:-

- *Guidelines for Planning Authorities and An Bord Pleanala on carrying out Environmental Impact Assessment (August 2018)* issued by the Department of Housing, Planning and Local Government (DHPLG);

- Circular Letters PL 1/2017 on *"Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive)"* and PL8/2017 on *"Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive) – Advice on electronic notification requirements"* issued by DHPLG;

- Draft *Guidelines on the Information to be contained in Environmental Impact Assessment Reports (August 2017)* published by the Environmental Protection Agency (EPA);

- *Environmental Impact Assessment of Projects: Guidance on Screening* (European Commission, 2017);

- *Environmental Impact Assessment of Projects: Guidance on Scoping* (European Commission, 2017);

- *Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report* (European Commission, 2017).

## 1.4 EIA Process

The EIA process may be summarised as follows:
1. Screening – Is EIA Required?
2. Scoping – If EIA is Required, what aspects of the Environment should be considered?
3. Preparation of EIAR
4. EIA carried out as part of the consent process

This process is illustrated in Fig 1.1 below.

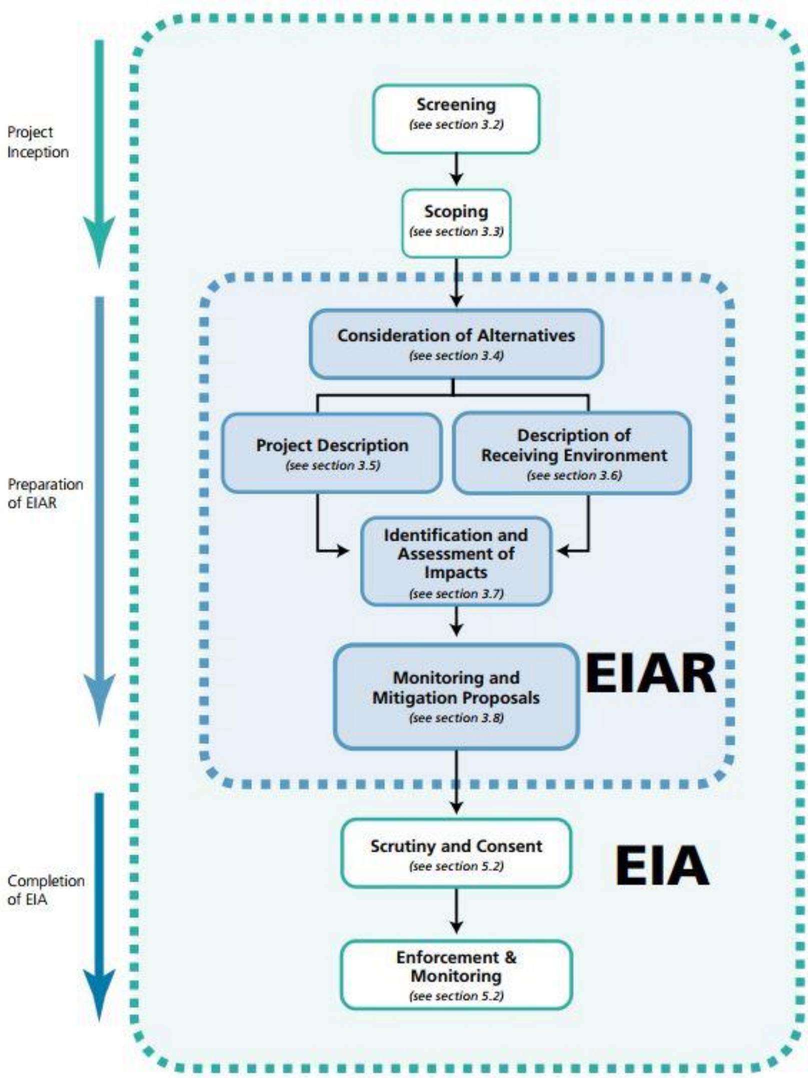


**Figure 1.2 EIA process (Source: Guidelines on the Information to be contained in an Environmental Impact Assessment Report, 2017)**

### *1.4.1 Definition of EIA and EIAR*

Directive 2014/52/EU defines 'environmental impact assessment' as a process, which includes the responsibility of the developer to prepare an Environmental Impact Assessment Report (EIAR), and the responsibility of the competent authority to provide reasoned conclusions following the examination of the EIAR and other relevant information. EIA is essentially a process for anticipating the significant effects on the environment likely to be caused by a project. EIA contributes to the environmental basis for the decision-making process. This helps ensure that consent decisions are made in knowledge of the environmental consequences of the project.

The 2014 Directive uses the term Environmental Impact Assessment Report (EIAR) rather than Environmental Impact Statement (EIS). Where current national guidelines and legislation refer to an EIS, this can be taken to be the same as an environmental impact assessment report (EIAR).

European Commission Guidelines**1** defines the EIAR as:-
*The document prepared by the Developer that presents the output of the assessment. It contains information regarding the Project, the likely significant effect of the Project, the Baseline scenario, the proposed Alternatives, the features and Measures to mitigate adverse significant effects as well as a Non-Technical Summary and any additional information specified in Annex IV of the EIA Directive.*

Where significant and likely environmental effects are identified that are unacceptable, the EIA process aims to quantify and minimise the impact specified development projects have on the environment through appropriate mitigation measures and where necessary, subsequent monitoring.

### *1.4.2 Screening for Environmental Impact Assessment*

'Screening' is the term used to describe the process for determining whether a proposed development requires an EIA by reference to mandatory legislative threshold requirements or in the case of sub threshold development, by reference to the type and scale of the proposed development and the significance or the environmental sensitivity of the receiving baseline environment.

Projects requiring EIA are defined in Article 4 and set out in Annexes I and II of the Directive.

All projects listed in Annex I require an EIA. For projects listed in Annex II, national authorities may set thresholds/criteria or determine effects on a case-by-case basis.

---

**1** *Environmental Impact Assessment of Projects: Guidance on Scoping (EC, 2017)*

Where a project is of a specified type but does not meet, or exceed, the applicable threshold then the likelihood of the project having significant effects on the environment needs to be considered. This is done by reference to the criteria specified in Annex III of the Directive.

Schedule 5 of the *Planning and Development Regulations 2001 (as amended)* transposes Annex I and II into Irish law.

Schedule 5, Part 2 includes the following Infrastructure projects

> *(b) (i) Construction of more than 500 dwelling units.*
>
> *(b) (iv) Urban development which would involve an area greater than 2 hectares in the case of a business district, 10 hectares in the case of other parts of a built-up area and 20 hectares elsewhere. (In this paragraph, "business district" means a district within a city or town in which the predominant land use is retail or commercial use.)*

The Competent Authority has determined that an EIAR is required having regard to the area of the site, at 11.4ha.

### *1.4.3 Scope of Environmental Impact Assessment*

'Scoping' is a process of deciding what information should be contained in an EIAR and what methods should be used to gather and assess that information. It is defined in European Commission Guidance[2] as:

> *The process of identifying the content and extent of the information to be submitted to the Competent Authority under the EIA process.*

The content of this EIAR was informed by a scoping process carried out by the applicant, design team and EIAR consultants to identify the substantive issues pertaining to the site and the proposed development.

## 1.5 Structure of the EIAR

The preparation of an EIAR necessitates the co-ordination and collation of associated, yet diverse specialised areas of assessment. The EIA approach involves the examination of each environmental factor, describing the existing baseline environment, the subject proposal, its likely impacts and direct and indirect significant effects pertaining to that environmental factor and mitigation measures, where appropriate.

The topics examined in this EIAR are categorised under the environmental factors prescribed under the 2014 EIA Directive as follows:-

- Population and Human Health
- Biodiversity
- Land & Soils

---

[2] *Environmental Impact Assessment of Projects: Guidance on Scoping (EC, 2017)*

- Water
- Air
- Climate
- Material Assets
- Cultural Heritage
- Landscape

The structure of the EIAR is as follows, whereby each environmental factor is examined in a separate chapter within the EIAR. The general structure of the EIAR is set out in Table 1.1 below:-

**Table 1.1: Structure of the EIAR**

| Chapter | Title | Content |
|---|---|---|
| 1.0 | Introduction and Methodology | Sets out the purpose, methodology and scope of the document |
| 2.0 | Site Location & Context | Describes the baseline environment |
| 3.0 | Description of the Proposed Development & Alternatives Considered | Sets out the description of the design and scale of development, and an evaluation of the main alternatives considered. |
| 4.0 | Population and Human Health | Describes the demographic and socioeconomic profile of the receiving environment, community infrastructure and potential impact on the overall human environment |
| 5.0 | Biodiversity | Describes the existing ecology on site and in the surrounding area, potential impacts and mitigation measures. |
| 6.0 | Land, Soils & Geology | Provides an overview of the baseline position, the potential impact of the proposed development on soil and geology and recommends mitigation measures |
| 7.0 | Hydrology and Water | Provides an overview of the baseline position, the potential impact of the proposed development on water quality and quantity and recommends mitigation measures |
| 8.0 | Air Quality and Climate | Provides an overview of the baseline air quality and climatic environment, the potential impact of the proposed development and recommends mitigation measures |
| 9.0 | Noise and Vibration | Provides an overview of the baseline noise environment, the potential impact of the proposed development and recommends mitigation measures |
| 10.0 | Landscape and Visual Impact Assessment | Assesses the visual impact of the proposed development on the landscape. |
| 11.0 | Cultural Heritage | Provides an archaeological, architectural and cultural heritage assessment of the site and its surroundings, and considers the potential impact of the proposed development on local archaeology, architecture and cultural heritage. |
| 12.0 | Material Assets | Provides an overview of the impacts on roads, built services and waste management and recommends mitigation measures |
| 13.0 | Interactions | Describes the likely interactions between effects predicted as a result of the proposed development. |

This systematic approach employs standard descriptive methods, replicable prediction techniques and standardised impact descriptions to provide an appropriate evaluation of each environmental topic under consideration.

A Non-Technical Summary of the EIAR has also been prepared. The EIA Directive states that one of the objectives of the EIA process is to ensure that the public are fully aware of the environmental implications of any decisions. The EPA guidelines note that the non-technical summary of the EIAR should facilitate the dissemination of the information contained in the EIAR and that the core objective is to ensure that the public is made as fully aware as possible of the likely environmental impacts of projects prior to a decision being made by the Competent Authority. A Non-Technical Summary of the EIAR has therefore been prepared which summarises the key environmental impacts and is provided as a separately bound document.

## 1.6 Methodology Employed to Evaluate Each Environmental Topic

An outline of the methodology employed throughout the EIAR to examine each environmental topic is provided below:

**Table 1.2 Methodology Employed to Evaluate Environmental Factors in the EIAR**

| | |
|---|---|
| Introduction | Provides an overview of the specialist area and specifies the specialist who prepared the assessment. |
| Study Methodology | This subsection outlines the method by which the relevant impact assessment has been conducted within that chapter |
| The Receiving Environment (Baseline Situation) | Describes the receiving environment, the context, character, significance and sensitivity of the baseline receiving environment into which the proposed development will fit. This also takes account of any proposed developments that are likely to proceed in the immediate surroundings. |
| Characteristics of the Proposed Development | Consideration of the 'Characteristics of the Proposed Development' allows for a projection of the 'level of impact' on any particular aspect of the environment that could arise. For each chapter those characteristics of the proposed development which are relevant to the area of study are described; for example the chapter on landscape and visual impact addresses issues such as height, design and impact on the surrounding landscape. |
| Potential Impact of the Proposed Development | This section provides a description of the specific, direct and indirect, impacts that the proposed development may have. This is provided with reference to both the Receiving Environment and Characteristics of the Proposed Development sections while also referring to the (i) magnitude and intensity, (ii) integrity, (iii) duration and (iv) probability of impacts. The assessment addresses whether the impacts are direct, indirect, secondary or cumulative in nature, it also looks at the timescale of such impacts e.g. are they short, medium, long-term, and are they of a temporary, permanent, continuous or intermittent nature, and are they positive or negative impacts. |
| Mitigation Measures | Avoidance, remedial and mitigation measures describe any corrective or mitigative measures that are either practicable or reasonable, having regard to the potential impacts of the scheme. |
| Residual Impacts of the Proposed Development | This section allows for a qualitative description of the resultant specific direct, indirect, secondary, cumulative, short, medium and long-term, temporary, permanent, continuous, or intermittent, positive and negative effects which the proposed development may have, assuming all mitigation measures are fully and successfully applied |
| Do Nothing Impact | In order to provide a qualitative and equitable assessment of the proposed development, this section considers the proposed development in the context of the likely impacts upon the receiving environment should the proposed |

| | |
|---|---|
| | development not take place |
| Monitoring | This involves a description of monitoring in a post-development phase, if required. This section addresses the effects that require monitoring, along with the methods and the agencies that are responsible for such monitoring. |
| Interactions | This section provides a description of impact interactions together with potential indirect, secondary and cumulative impacts |
| Difficulties Encountered in Compiling | This section provides an indication of any difficulties encountered by the environmental specialist in compiling the required information. |

## 1.7 EIAR Team

The Environmental Impact Assessment Report was completed by a project team led by Simon Clear & Associates (SCA), who also prepared a number of the chapters.

In accordance with EIA Directive 2014/52/EU, we confirm that the experts involved in the preparation of this EIAR are fully qualified and competent in their respective fields. Each has extensive proven expertise in the relevant field concerned, thus ensuring that the information provided herein is complete and of high quality. The individual members of the team and their respective inputs and competency are detailed below. Table 1.3 below provides an overview of the various consultancies who prepared the relevant chapters.

**Table 1.3: EIAR Study Team**

| Chapter | Consultant | Contributor |
|---|---|---|
| 1. Introduction | Simon Clear & Associates | Darran Quaile BA MRUP MScBLUP MIPI holds a degree in Environmental Science (TCD) and Masters in Planning (UCD) and Biodiversity (NUIG)<br>Darran is a Planner with 15 years' experience in planning and development projects including experience of directing and contributing to the preparation of EIARs for a variety of projects. |
| 2. Site Location & Context | Simon Clear & Associates | Paula Shannon BA MRUP holds a degree in Geography and a Masters in Planning from UCD.<br>Paula is a Planner with 5 years' experience in planning and development projects, with particular involvement in the management of Strategic Housing Developments. |
| 3. Description of Development & Alternatives Considered | Simon Clear & Associates | Paula Shannon |
| 4. Population & Human Health | Simon Clear & Associates | Darran Quaile BA MRUP MScBLUP MIPI |
| 5. Biodiversity | Panther Environmental | Ross Bryant BSc MSc PhD<br>Ross holds an honours degree in Biology from Maynooth University, an MSc in Environmental Science from TCD and a PhD in Biosystems Engineering from UCD.<br>Ross was a Research Fellow in Geography |

| | | |
|---|---|---|
| | | Department of TCD and lecturer on soil science and hydrology at Dundalk Institute of Technology. |
| 6. Land, Soil & Geology | Muir Associates | Slaven Sose BEng, MIEI has more than 10 years post graduate experience in civil engineering design and has extensive experience in the design of the engineering elements associated with large residential schemes.<br>Filip Sertic MEng, has more than 10 years post graduate experience in civil engineering design and has extensive experience in the design of the engineering elements associated with large residential schemes. |
| 7. Hydrology & Water | Muir Associates | Slaven Sose BEng, MIEI<br>Filip Sertic MEng |
| 8. Air Quality & Climate | Panther Environmental | Martin O'Looney BSc has over seven years consultancy experience and has a Degree in Environmental Science and Technology from Sligo Institute of Technology.<br>Tom Madden BSc has over three years consultancy experience and has Degree in Environmental Science from the University of Limerick. |
| 9. Noise & Vibration | Panther Environmental | Martin O'Looney BSc<br>Tom Madden BSc |
| 10. Landscape & Visual Impact Assessment | Jane McCorkell Landscape | Jane McCorkell BSc MLA MILI is a chartered Landscape Architect with a degree in Horticulture and a Masters in Landscape Architecture. She is a Member of the Garden & Landscape Design Assoc. (MGLDA). Her design practice is in operation since 2005. |
| 11. Cultural Heritage | Byrne Mullins & Associates | Byrne BA MA holds a degree in Archaeology & History (UCC) and a Masters in Archaeology (UCC), as well as a Diploma in EIA Management (UCD). He has over 30 years' experience in preparing Archaeological and Cultural Heritage assessments. He is founding Board Member and former Chairperson of the Institute of Archaeologists of Ireland (IAI). |
| 12. Material Assets | Muir Associates | Slaven Sose BEng, MIEI<br>Filip Sertic MEng |
| 13. Interactions | Simon Clear & Associates | Darran Quaile |

## 1.8 Statement of Difficulties Encountered

The EIA Regulations require that difficulties such as technical deficiencies, lack of information or knowledge encountered in compiling any specified information for the EIAR be described. There were no such difficulties encountered in the production of this EIAR.

# 2. SITE LOCATION & CONTEXT

## 2.1 Context

The development site is located on the southwestern edge of the built-up area of Newbridge, Co. Kildare in the townland of Ballymany. The site is c.1.5km south west of Newbridge town centre and c.700m north east of the M7 motorway interchange (junction 12) with Ballymany Road (R445). The site forms part of a larger landholding, for which permission was granted for residential development and a nursing home (KCC Ref. 16/658, ABP 249038).

Standhouse Road and a number of individual residential dwellings are located along the northern boundary of the site. The northern section of proposed development site was formerly in agricultural use (tillage) and the southern part was previously used for permitted sand and gravel extraction.

**Figure 2.1: Aerial Image of the Lands prior to the commencement of Phase 1 of Development (Source: Google Earth, 2022)**

The south eastern boundary of the site is occupied by construction works for residential development (ABP Ref. 249038) extending to the R445 road, a regional road linking the M7 to Newbridge. The construction works are proceeding under the provisions of a 10-year planning permission granted by An Bord Pleanala in 2018. The main vehicular access to the site will be provided by a residential road under construction, which has a junction with the R445, Ballymany Road. The R445 is also a bus route in Newbridge.

The secondary access will be from a new junction on the Standhouse Road (L7037). Standhouse Road runs in an east-west alignment along the northern boundary. It will be improved along the site frontage with a new junction and footpath provision to link to the existing footpath leading east towards Newbridge train station.

**Figure 2.2: View looking East along Standhouse Road with the construction works for the road evident to the right of the image. (Source: Google Streetview, 2021)**

Part of the eastern boundary adjoins an existing low-density residential estate development, The Elms and Scoil Mhuire Senior School abuts the northeastern boundary. The entire western boundary adjoins the mature landscape of the treelined Ballymany studfarm field enclosures.

**Figure 2.3: Site Location Map with Site Outlined in Red. (Source: OSI, 2021, edited by SCA)**

The subject site outlined in red has a gross site area of 11.4ha and a nett site area of 9.61ha.

## 2.2 Detailed Description of the Site

Sand and gravel extraction was carried out on the southern half of the site lands on foot of planning permission (KCC Ref. 06/547), which was put into effect in respect of this part of the permitted development. Currently, these lands within the subject site present an excavated landscape, with mounds of overburden dispersed over a significant part of the site. The northern, unexcavated lands within the subject site were used for arable farming.

The commercial sand and gravel extraction reduced levels over the southern part of the subject site compared to adjoining lands – those to the east at the Elms housing estate and to the west - the tree-lined Ballymany Stud, with the subject site is nestled between these.

The natural land profile in the area is undulating, with the ground level on the site significantly lower in comparison to the Curragh. The general topography between the site and the Curragh rises by up to 20m upwards to the Curragh Plain, which is generally elevated, with the compartmentalised hedgerow-bounded fields within the Ballymany Stud intervening.

**Figure 2.4: Measured distance across Ballymany studfarm from the edge of the Curragh to the western edge of the site >800m, showing the excavation on the subject site in the upper right-hand corner. (Source: Google Aerial, edited by SCA)**

The exaction works included the development of a berm along the R445, which restricts views from the road towards the subject lands. With the construction of Phase 1 housing development ongoing, there will be no direct views to the proposed development on the subject lands from the R445.

**Figure 2.5: View looking south west along the R445 with berm at site entrance on the right. (Source: GNet3D, 2020)**

The site is located within the range of the Curragh Aquifer, which is an extensive, regionally important aquifer extending to 200km$^2$ in area. Due to its importance, it has been subject to detailed hydrogeological study and monitoring for a number of years, extending to decades.

Kildare County Council possesses good information on the hydrogeological structure of the Curragh Aquifer and its relationship to the Pollardstown Fen. In respect of the aquifer groundwater regime, there are a number (10) of static monitoring boreholes owned by Kildare County Council, which record the groundwater level within the Curragh Aquifer generally and within the vicinity of the site.

On-site boreholes have been opened to test the groundwater level and geological make-up of the subsurface strata across the subject site. Boreholes have been opened at each of the surface water drainage interventions on the subject site. Monitoring has been ongoing on the subject site since 2020. The subsoil strata are made up of till and sand and gravel profiles above groundwater levels. This is not a karst profile and the profile provides good filtration.

The historical and ongoing independent recordings in respect of the Curragh aquifer and on-site testing provide robust and verifiable hydrogeological information. On-site excavations have provided information on depth to water table and sub-surface strata providing filtration. This empirical information has been used to support conclusions in this EIAR.

## 2.3 Relevant Planning History

### *2.3.1 Ref. 06/547*

Kildare County Council granted planning permission for low density residential development for 190 houses (down from 196 applied for) and for sand and gravel extraction from the land. The sand and gravel extraction was carried out but the housing development did not subsequently proceed. The excavated condition of a significant part of the site, with aggregate stockpiles derives from this planning permission.

### *2.3.2 Ref. 16/658 ABP 249038*

An Bord Pleanala granted permission in April 2018 for a mixed-use development comprising 280 no. dwelling houses, a single storey crèche facility (307m$^2$) and a 103 - bedroom nursing home facility at Ballymany, Newbridge, Co. Kildare.

The initial scheme had a density of 15.7 units per hectare and ABP sought a revision to increase density in accordance with Ministerial Guidance. The permitted scheme has a density of 21.7 units per hectare.

Phase 1 of the development, as permitted under Ref.16/658 (ABP-249038), closest to the R445, is currently under construction and includes 54 no. dwellings and the construction of a section of the Link Road under Objective SRO 5 (b) of the KCDP, which seeks the construction of a link road from the L7042 Green Road to the L7037 Standhouse Road, including a new junction with the R445 Ballymany Road.

This permission was granted in 2018 has a duration of permission for a period of 10 years.

### *2.3.3 Reg. Ref. 19/710 (ABP-305410-19)*

Planning permission refused by KCC and ABP for amendments to the initial phase of development on the subject lands. The amendment sought permission for the construction of 71 no. dwellings in lieu of 33 no. dwellings and a crèche. 1 no. reason for refusal was provided by ABP, which can be summarised as the density being too low, resulting in an inefficient use of scarce zoned and serviced land.

### *2.3.4 Reg. Ref. 20/1307*

Planning permission was sought for amendments to the creche facility permitted under Ref. 16/658. This planning application was withdrawn as the SHD application includes a childcare facility to replace the permitted facility in Phase 1. The proposed creche has been designed with capacity to cater for the development on the entire landholding.

### *2.3.5 SHD Application Ref. ABP 310912*

Permission refused on this site for a development of 336 no. residential units, consisting of 245 houses, 91 apartments, creche and associated site works. Permission was refused for 1 no. reason - absence of EIAR. The current proposal is the same as previous and this EIAR has been prepared to accompany the application.

### *2.3.6 SHD Application ABP 311040 – 21*

Permission granted for 204 residential units (98 houses and 106 duplexes/apartments) and associated site works on a site located on the opposite, southern side of the R445.

# 3. DESCRIPTION OF DEVELOPMENT & ALTERNATIVES CONSIDERED

## 3.1 Introduction

This chapter of the *Environmental Impact Assessment Report* has been prepared by Simon Clear & Associates. In accordance with Article 5(1)(a) of the 2011 EIA Directive, as amended by Directive 2014/52/EU, the description of the proposal should comprise "*…information on the site, design, size and other relevant features of the project*".

Annex IV (2) of the EIA Directive and Schedule 6(1)(d) of the *Planning & Development Regulations, 2001 (as amended)* require the following information to be included:-

"*A description of the* ***reasonable alternatives*** *studied by the person or persons who prepared the EIAR, which are relevant to the proposed development and its specific characteristics and an indication of the main reasons for the options chosen, taking into account the effects of the proposed development on the environment*" (our emphasis).

## 3.2 Overview of relevant features of the project

The proposed Strategic Housing Development will consist of:-

Future phases of a residential development (Curragh Farm development) of which Phase 1 (54 no. units and Link Road) is currently under construction on foot of planning Ref. 16/658 (ABP Ref. PL09.249038), which provided for 280 dwelling units, creche, nursing home and Link Road.

The overall development will provide 390 no. units and creche on completion.

The proposed SHD residential development with creche will consist of the following:-

- Construction of 336 no. residential units consisting of 245 no. houses, 27 no. apartments and 64 no. duplexes;
- The 245 no. houses will comprise 2-storey, detached, semi-detached and terraced units to include:-
    - 17 no. 2-bed houses;
    - 184 no. 3-bed houses;
    - 44 no. 4-bed houses;
- The 27 no. apartments are located in a part 3-storey and part 4-storey building and include:-
    - 13 no. 1-bed units;
    - 13 no. 2-bed units;
    - 1 no. 3-bed unit;
- The 64 no. duplexes are located across 6 no. 2 to 3-storey buildings and include:-
    - 32 no. 1-bed units;
    - 16 no. 2-bed units;
    - 16 no. 3-bed units;
    - A 2-storey creche;

- Car parking, bicycle parking, internal roads, services infrastructure, bin stores and bicycle stores;
- Footpath improvements along Standhouse Road;
- Landscaping, open spaces, play areas, boundary treatment and public lighting;
- All associated site works and services.

## 3.3 Key Site Statistics

The key development statistics for the proposal are outlined in Table 3.1 below.

**Table 3.1: Key Development Statistics**

| | |
|---|---|
| ***Site Statistics*** | |
| Site Area | 11.4 hectares |
| Net Site Area | 9.61 hectares |
| Number of Units | 336 |
| Density | 35 units per hectare |
| Plot Ratio | 0.3 |
| Site Coverage | 17% |
| Open Space | 17,626m$^2$ (15.4%) |
| ***Gross Areas m$^2$*** | |
| Gross Floor Area | 34,799.95 |
| Residential | 34,183.95 |
| Non-Residential | 616 |
| ***Residential Accommodation unit nos. (%)*** | |
| 1-bedroom | 45 (13.3%) |
| 2-bedroom | 46 (13.7%) |
| 3-bedroom | 201 (60%) |
| 4-bedroom | 44 (13%) |
| ***Commercial Accommodation m$^2$*** | |
| Creche | 616 |
| ***Open Space m$^2$*** | |
| Public Open Space | 17,626 |
| ***Parking*** | |
| Car parking spaces | 617 + 3 drop off |
| Cycle parking spaces | 146 |

## 3.4 Layout & Design

The context of the site, particularly the Phase 1 development currently under construction to the south and the link Road to the west, has shaped the layout of the proposed development. The proposal has been designed to integrate with the Phase 1 development and provide a continuation of development throughout the site towards Standhouse Road to the north.

The layout has a strong street network with large areas of public open space located throughout to ensure accessibility from all residential units. A creche facility is provided in the centre of the site, which will serve the entire development site, including the units under construction as part of Phase 1. The location of the creche facility allows easy access from within the site and from the Link Road to the west.

A number of semi-detached and detached houses are provided in the south western part of the site, 2 no. of which are accessed directly from the Link Road and the remainder from 3 no. shared entrances off the Link Road. The density for this section of the site mirrors the medium density of the Phase 1 development backing onto these units.

The main middle section of the site consists of semi-detached houses, with some short terraces and 4 no. duplex blocks. The part 3-storey, part 4-storey apartment building is located in the north western part of the subject site and has been carefully located away from existing residential units on Standhouse Road.

Materials selected are comprised of predominantly robust brick at ground floor levels and pigmented render above. The terminations of urban blocks are punctuated with brick bookends in all locations, and there are no blank gables.

## 3.5 Residential Accommodation

Overall the proposal provides 336 no. residential units consisting of 245 no. houses, 27 no. apartments and 64 no. duplexes. The entire development consists of 45 no. 1-bed units, 46 no. 2-bed units, 201 no. 3-bed units and 44 no. 4-bed units.

There are 8 no. house types as follows:-

**Table 3.2: Schedule of House Types**

| House Type | Area ($m^2$) | No. of Rooms | No. of Storeys |
|---|---|---|---|
| B1 | 132 | 4 | 2 |
| C1 | 107.5 | 3 | 2 |
| C2 | 114 | 3 | 2 |
| C3 | 108.4 | 3 | 2 |
| C4 | 107.5 | 3 | 2 |
| C5 | 110 | 3 | 2 |
| D | 87.6 | 2 | 2 |
| E | 161.9 | 4 | 2 |

The duplexes are provided in a number of 2 and 3-storey blocks throughout the site.

The apartments are provided in a part 3 and part 4-storey building located towards the north of the site.

## 3.6 Childcare Facility

The 2-storey creche is provided towards the centre of the site, adjacent an area of open space and is easily accessible from the Link Road. The creche has an area of 616$m^2$ and an outdoor play space with an area of 320$m^2$. The creche can provide up to 102 no. childcare spaces.

The facility has been designed to provide sufficient capacity to cater for any childcare demand arising from the development of the overall landholding, including the 54 no. units under construction in Phase 1.

## 3.7 Landscaping and Open Space

A comprehensive and integrated open space design, which works with the proposed built fabric and circulation through the scheme has been created in consultation with the Parks Department of Kildare County Council.

Homezones are included to provide a safe movement environment with an animated streetscape, dedicated play areas and larger open spaces. There are 6 no. large areas of public open space throughout the site with further areas of open space provided to the west of the Link Road.

The existing topography of the site has been considered to ensure integration of useable open spaces within the site boundaries and integrating with the Phase 1 open space and movement proposals.

## 3.8 Infrastructural Services

### *3.8.1 Foul Drainage*

There is an existing 225mm diameter foul sewer along the R445 Ballymany Road immediately to the southeast of the proposed development and a 225 mm diameter foul sewer along Standhouse Road to the north west of the site.

A Pre-Connection enquiry form was submitted to Irish Water for 360 No residential units on the site in October 2020 based on a gravity connection to the existing foul sewer in Standhouse Road. Irish Water responded in November 2020 and noted that subject to a valid connection agreement being put in place, the proposed connection to the Irish Water wastewater network can be facilitated subject to the completion of the Upper Liffey Valley Regional Sewerage Scheme Contracts 2A and 2B. Irish Water have also issued a Statement of Design Acceptance in respect of the foul drainage arrangements.

It is proposed to connect the foul drainage discharge from the proposed development to the existing 225mm diameter foul sewer located in Standhouse Road. The location of the outfall sewer is illustrated on Muirs Associates Limited (MAL) drawing No's D1920-MAL-00-XX-C-017 and D1920-MAL-00-XX-C-018. The outfall will require the replacement of a 270 m section of the existing foul sewer in Standhouse Road and this upgrade proposal has been submitted to and agreed with Irish Water.

### *3.8.2 Surface Water Drainage*

The topography of the site generally slopes from east to northwest. There is an existing 225mm diameter public surface water drainage network at the Standhouse Road and the Seven Springs Road junction which runs along Standhouse Road in an easterly direction.

The proposed development will have separate foul and surface water drainage networks. The design of the surface water drainage network for the proposed development consists of a piped gravity system. It is proposed to discharge the surface water runoff from the proposed development to the existing storm water sewer in Standhouse Road via a series of geocellular attenuation storage facilities located on the site. The surface water discharge to Standhouse Road will be controlled by a flow control device which will limit the discharge rate to the greenfield site peak runoff rate. There are also 2 No soakaways which will discharge surface water runoff directly to ground.

### *3.8.3 Water Supply*

There is an existing 100mm diameter uPVC waterman along the R445 Ballymany Road immediately to the southeast of the site. A 50mm diameter watermain is located on the northern boundary of the site on Standhouse Road. Irish Water confirmed that the proposed connection to the Irish Water network can be facilitated subject to the completion of water network upgrades including:-

- Approximately 10m of new 200mm ID pipe main to be laid to connect the site development to the new 200mm ID main;
- Approximately 700m of new 200mm ID pipe main to replace the existing 3” uPVC main.

The applicant is willing to fund these works and has included the upgrades in the drawings prepared and submitted as Irish Water have advised that they do not have any plans to implement these upgrades.

The main connection for the water supply for the proposed development will be from the upgraded watermain on the Standhouse Road. It is also proposed to connect to the existing watermain network currently under construction. A 200mm diameter watermain central feed will be provided throughout the development which in turn will feed 150mm and 100mm diameter loops.

## 3.9 Phasing and Construction Management

It is proposed that the development of the overall site will be broken down into 7 no. phases. Phase 1 (54 no. units) is currently under construction and the subject proposal will consist of phase 2-7. The following is a breakdown of the proposed development in each phase:-

- Phase 2: 56 no. dwellings and creche facility
- Phase 3: 88 no. dwellings and public open space (0.4ha)
- Phase 4: 93 no. dwellings and public open space (0.08ha)
- Phase 5: 38 no. dwellings and public open space (0.4ha)
- Phase 6: 34 no. dwellings
- Phase 7: 27 no. dwellings and public open space (0.3ha)

An Outline Construction Management Plan has been prepared by MAL and is included with the planning application. The plan sets out a framework of measures to address the implications of the construction works. Subject to a successful grant of planning permission, it is intended that the works will commence in late 2022. The proposed development is anticipated to be constructed over a period of 36 months.

It is anticipated that for the duration of the works all access and egress to the site for construction related activities will be via either Ballymany Road or Standhouse Road.

## 3.10 Waste Management

An Outline Construction and Demolition Waste Management Plan has been prepared by MAL and is enclosed with the planning application.

### *3.10.1 Construction Waste*

Given the nature of the project and the construction methodologies to be adopted it is anticipated that the main waste types generated during the construction phase of the project will be the volumes of excavated material arising from excavations for foundations, trenches to receive utilities and the road formation.

It is proposed (subject to the phasing of the proposed development) that the majority of material arising from the excavations will be reused for filling within the project area. Material deemed unsuitable from an engineering perspective will be used in landscaping. Any excess material arising from the project will be disposed off-site in accordance with the requirements of the Waste Management Act and subsequent amendments.

## 3.11 Emissions & Nuisances

No significant impacts are likely to arise in terms of emissions and nuisances during the construction and operational period of the development. A detailed assessment of the potential impacts on air quality, noise and vibration is contained in Chapters 8 and 9 of this EIAR respectively. In addition, the *Outline Construction Management Plan* details the mitigation measures proposed to ameliorate any potential negative impacts.

## 3.12 Risk of Accidents

The risk of accidents arising as a result of the proposed development at the construction stage will be minimised by implementation of a Construction Management Plan and in the operational phase will be minimised through implementation of building regulations, detailed design considerations and health and safety operational management. Details of these design considerations and construction management measures are contained in the *Outline Construction Management Plan* enclosed with the planning application documents.

## 3.13 Secondary Projects

The Phase 1 development under construction at the time of making the application for the subject project provides primary access to the R445 road and some interlinked services and public open space.

Phase 1 of the Curragh Farm development, as permitted under Ref. 16/658, is currently under construction. To ensure that the subject project can be delivered independently, the application includes the already permitted Link Road that runs along the western site boundary extending to Standhouse Road.

## 3.14 Consideration of Alternatives

This section of the EIAR provides a description of the main alternatives examined throughout the design and consultation process.

Reasonable alternatives may relate to project design, technology, location, size and scale which were studied in the preparation of the EIAR relevant to the proposed development and its particular characteristics, together with an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects. The *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment* of August 2018 provide further guidance on this matter as follows:

"*The types of alternatives will depend on the nature of the project proposed and the characteristics of the receiving environment. For example, some projects may be site specific so the consideration of alternative sites may not be relevant. It is generally sufficient for the developer to provide a broad description of each main alternative studied and the key environmental issues associated with each. A 'mini-EIA' is not required for each alternative studied*".

For the purposes of the Regulations, alternatives may be described at three levels:

- Alternative Locations
- Alternative Designs
- Alternative Processes

As indicated above, the proposed scheme is site specific in the context of the planning permission already granted (and subject to EIAR at the time of the grant of planning permission), which permission is being put into effect.

The main alternatives studied during the development of the subject project comprise alternative design solutions and layouts to provide a residential development on the site, in accordance with National, Regional and Local planning policy.

The rationale for the development is to provide residential accommodation in accordance with the zoning designation for the site. This is fully supported in National, Regional and Local planning policy. In this regard, the *National Planning Framework 2040- Our Plan (2018)*, identifies the need for consolidated growth in urban areas.

**National Policy Objective 11**
*'In meeting urban development requirements, there will be a presumption in favour of development that can encourage more people and generate more jobs and activity within existing cities, towns and villages, subject to development meeting appropriate planning standards and achieving targeted growth.'*
**National Policy Objective 13**

*'In urban areas, planning and related standards, including in particular building height and car parking will be based on performance criteria that seek to achieve well-designed high quality outcomes in order to achieve stated outcomes, provided public safety is not compromised and the environment is suitably protected.'*

**National Policy Objective 27**
*'Ensure the integration of safe and convenient alternatives to the car into the design of our communities, by prioritising walking and cycling accessibility to both existing and proposed developments and integrating physical activity facilities for all ages.'*

**National Policy Objective 28**
*'Plan for a more diverse and socially inclusive society that targets equality of opportunity and a better quality of life for all citizens, through improved integration and greater accessibility in the delivery of sustainable communities and the provision of associated services.'*

**National Policy Objective 32**
*'To target the delivery of 550,000 additional households to 2040 National Policy.'*

**National Policy Objective 33**
*'Prioritise the provision of new homes at locations that can support sustainable development and at an appropriate scale of provision relative to location.'*

**National Policy Objective 34**
*'Support the provision of lifetime adaptable homes that can accommodate the changing needs of a household over time.'*

**National Policy Objective 35**
*'Increase residential density in settlements, through a range of measures including reductions in vacancy, reuse of existing buildings, infill development schemes, area or site- based regeneration and increased building heights.'*

The Eastern and Midland Regional Spatial and Economic Strategy 2019-2031 provides regional policy objectives to assist in the achievement of the policy objectives of the NPF.

The following Growth Enablers set out in the RSES are applicable:-

- Embed a network of Key Towns throughout the Region, which have the capacity to deliver sustainable compact growth and employment for their catchments in tandem with enabling public transport, infrastructure and services.
- Promote balanced growth in a limited number of economically active settlements which have the identified capacity and potential for self-sustaining growth, with emphasis on the key towns in the urban hierarchy.

The site is zoned C2 in the Newbridge Local Area Plan – "*C New Residential: To provide for new residential development. This zoning provides for new residential development and associated ancillary services. Permission may also be granted for home based economic activity within this zone subject to the preservation of* *residential amenity and traffic considerations. New residential areas should be developed in accordance with a comprehensive plan detailing the layout of services, roads, pedestrian and cycle routes and the landscaping of open space."*

Lands zoned C2 have a specific objective where *'a maximum density of 15 units per hectare will apply.'*

## 3.14 Alternative Locations and 'Do Nothing Scenario'.

The development is site specific therefore, it was not deemed necessary to consider alternative sites for the proposed development. The subject lands have already been subject to permitted sand and gravel extraction and are currently being progressively redeveloped for residential development under extant planning permission: -

- The main entrance road and junction on the R445 have been constructed;
- 38kv power lines traversing the western side of the lands, on a south-north alignment to Standhouse Road have been located underground;
- A number of houses have been constructed to completion stage and others are under construction;
- Services have been laid.

A 'do nothing scenario' in respect of the subject project, will see the lands redeveloped from the current post-aggregates extraction presentation to a residential estate under the existing permission which has a duration to 2028.

## 3.15 Alternative Designs

The applicant acquired the subject site with the benefit of planning permission for 280 no. dwellings and a nursing home, granted under Ref. 16/658 (ABP-249038). The design team was tasked with reviewing the development to consider alternative options for the development of the site, having regard to current planning and environmental considerations.

Therefore, the first alternative design is the permitted development. During the review process several iterations of the site layout and alternative designs were considered, as described below.

### *3.15.1 Alternative Layout 1 – Extant Permission*

The layout shown in Fig 3.1 below is an extract of the layout, which was submitted to An Bord Pleanala (ABP) under Planning Ref. 16/658 (ABP-249038). Planning permission was granted, subject to conditions, in April 2018. Phase 1 of this layout is currently under construction on the lands.

An alternative design for Phase 1 was submitted as a planning application and was refused permission on appeal by An Bord Pleanala for 1 no. reasons summarised as follows: -
*Notwithstanding the specific density provisions of the Newbridge Local Area Plan, 2013-2019 (extended until 2021) which indicates a maximum density of 15 units per hectare on lands zoned Objective C2, it is considered that the proposed*

*development of 22.6 units per hectare and the impact of the proposed amendment on the density of the overall residential development of the appeal site and adjoining lands to the north which would increase to approximately 24.3 units per hectare, would therefore result in a form of development which would result in an inefficient use of scarce zoned and serviced lands, and which would be contrary to the provisions of the Guidelines and the development plan. The proposed development would, therefore, be contrary to the proper planning and sustainable development of the area.*

**Figure 3.1 Layout of Development permitted under Ref. 16/658. Source: Kildare County Council Planning Webpage. Drawing prepared by Van Dijk Architects.**

Construction was commenced on Phase 1, with redesign considerations based upon the indicated need for general higher density in the remainder of the permitted development.

This alternative was permitted by ABP following a full environmental impact assessment. No significant negative impacts on any environmental factor were identified in the Environmental Impact Statement (EIS). The Inspector's Report considered the EIS and was satisfied with its content.

### 3.15.2 *Alternative Layout 2 – Initial Revised Design*

Reddy Architects reviewed the permitted development with the view of designing a residential development with a sustainable density that would tie in with the Phase 1 development under construction.

As shown in Fig 3.2 below, the revised scheme sought to create a more permeable layout with a reduced number of entrance points onto the Link Road.

**Figure 3.2 Alternative Layout 2. Source: Reddy Architecture & Urbanism**

The revised scheme excluded the commercial nursing home to provide a greater emphasis on housing identified needs for general housing accommodation. Areas of public open space were located throughout the site to provide easy access to amenity areas from all residential units.

In comparison to Alternative 1, this layout is considered have a positive impact on the following factors:-

- Population & Human Health – the layout provides for additional residential accommodation at a more sustainable density at a location that is well served by social infrastructure.
- Material Assets (Roads & Traffic) – by reducing the number of vehicular access points onto the Link Road, the layout allows the road to function more safely.

On review, a number of issues were identified with the initial revised design:-

- Archaeological zone in northern open space needed to be expanded;
- Layout of units to north, closest to Standhouse Road was very dense and needed reconsideration;
- North eastern section was also very dense and lacked access to significant open space.

### *3.15.3 Alternative Layout 3 – Design for Tripartite Stage*

The scheme was revised on foot of feedback from Kildare County Council and emphasis was placed on creating a coherent and permeable layout where public amenity space would be easily accessible from each residential unit.

The layout as shown in Fig. 3.3 was revised to enlarge the area of open space to the north, which is a zone of archaeological potential and has been reserved as open space to protect any potential archaeological materials. An area of open space was also introduced in the north-eastern section to break up the blocks of housing.

**Figure 3.3 Alternative Layout 3. Source: Reddy Architecture & Urbanism**

In comparison to Alternative 2, this layout is considered to have positive impacts on the following factors:-

- Population & Human Health – the provision of additional public amenity space provides a better quality living environment for the future population.
- Cultural Heritage – the inclusion of a larger archaeological buffer zone around potential archaeological features will ensure that these can be retained in situ.

While the general layout was improved there were still a number of issues with this approach as advised at the Tri-Partite meeting:-

- Layout is reliant on Link Road being constructed under existing permission for access to the land;

- The internal road parallel to the Link Road should be revised to be DMURS compliant.

### *3.15.4 Alternative Layout 4 – Final*

The prospective applicant was advised to incorporate elements of the permitted Link Road into the proposed site at Tri-partite consultation stage, enlarging the site area under consideration to that now shown (11.4ha).

The creche facility, as permitted under the original permission was not large enough to cater for the overall development proposal on the lands. A larger creche facility was designed and was relocated towards the centre of the site to increase accessibility for residents and those using the Link Road.

Having reviewed the ABP Opinion, a few final issues were identified in respect of the layout:-

- Provision of a buffer zone around the ESB mast in the northern part of the site;
- Further consideration of the useability of 2 small areas of open space in south eastern section of the site.
- Provision of public footpath along Standhouse Road.

The final layout as shown in Fig. 3.4 addresses these issues.

**Figure 3.4 Final Design as submitted. Source: Reddy Architecture & Urbanism**

In comparison to Alternative 3, this layout is considered to have positive impacts on the following factors:-

- Population & Human Health
  - The provision of a larger creche facility will ensure that future residents have access to childcare within the development, thus enhancing quality of life.
  - The provision of one larger public amenity in the south east ensures that this space is functional and will enhance the quality of life of residents.
  - The provision of a section of footpath along Standhouse Road enhances connectivity and safe access to the surrounding amenities, including the nearby school and church.
- Material Assets (Roads & Traffic) – the inclusion of the Link Road in the development ensures that the entire scheme can be delivered independently

of the permitted development. The provision of DMURS compliant internal roads ensures a safe environment for users.

# 4. POPULATION & HUMAN HEALTH

## 4.1 Introduction & Methodology

This chapter of the *Environmental Impact Assessment Report* has been prepared by Simon Clear & Associates and evaluates the impacts of the proposed development on population and human health.

European Commission Guidance[3] states:-

> *"Human health is a very broad factor that would be highly Project dependent. The notion of human health should be considered in the context of the other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population".*

EPA Guidelines[4] acknowledge that *"..the assessment of impacts on population and human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in this EIAR e.g. under the environmental factors of air, water, soil etc."*

In this regard, potential impacts of this project on population and human health are also addressed in the following Chapters of this EIAR: -

Air Quality and Climate (Chapter 8)
Noise and Vibration (Chapter 9)
Landscape & Visual Impact Assessment (Chapter 10)
Material Assets (Chapter 12)

### *4.1.1 Site Visit*

A site visit was undertaken 15 July 2021 as part of this assessment. The application site and surroundings were visited to examine the receiving environment insofar as people and communities are concerned and, in particular, to identify the people most likely to be affected by the project.

---

[3] Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017)

[4] Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft (EPA, 2017)

### *4.1.2 Desktop Assessment*

The study area was defined and the nearest sensitive receptors were identified. The presentation of the receiving environment is based on site visits and a desk-based study. The study area profile is based on official Census data by the Central Statistics Office (CSO) (www.cso.ie). Ordnance Survey maps and aerial photography were examined.

Based on this baseline presentation of the receiving environment, the likely significant adverse impacts on population and human health were considered and are presented under the following headings: -

- Land Use
- Population
- Employment and Economic Activity
- Human Health

Mitigation and Monitoring Measures are proposed in respect of the above topics, where appropriate.

The impact assessment section of this chapter follows the terminology (where applicable) used in the EPA Guidelines[5]. While perceptions of project can be somewhat subjective, it is considered that the impacts presented are broadly representative of the impacts on the population within the study area.

## 4.2 Description of Receiving Environment

The Study Area selected for the assessment of baseline population factors and of potential impacts on human health is presented in Figure 4.1 below. The site is located in the Electoral Division (ED) of Morristownbiller. The Study Area also includes the adjoining EDs of Newbridge and Pollardstown.

---

[5] Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft (EPA, 2017)

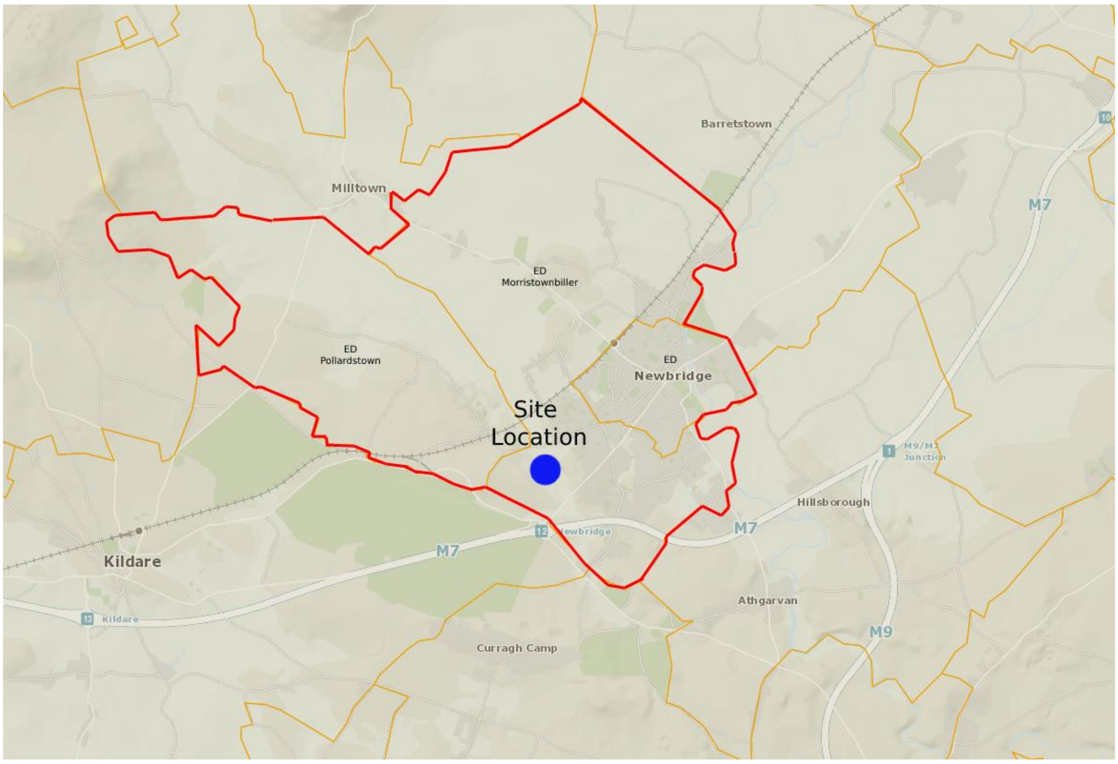


Figure 4.1: Study Area (Source: CSO 2016 SAPS Maps, annotated by SCA, 2022)

### 4.2.1 *Population Trends*

The most recent census of population was carried out by the CSO on the 24th April 2016. The previous census was completed on the 10th April 2011.

Between 2011 and 2016 the population in Co. Kildare grew by 5.8% while that of the Study Area grew by 5.2%. The ED of Morristownbiller exceeded the county average with growth of 6.7%.

**Table 4.1: Population change, County and Study Area (CSO, 2011 & 2016)**

| Area | 2011 | 2016 | % Change 2011-2016 |
|---|---|---|---|
| **State** | 4,588,252 | 4,761,865 | +3.8& |
| **Co. Kildare** | 210,312 | 222,504 | +5.8% |
| **Newbridge ED** | 7,563 | 7,762 | +2.6% |
| **Morristownbiller ED** | 13,852 | 14,781 | +6.7% |
| **Pollardstown ED** | 305 | 314 | +2.9% |
| **Study Area** | 21,720 | 22,857 | +5.2% |

### 4.2.2 *Age Profile*

The age profile of the population in the Study Area is an important parameter as it provides a good insight into the potential labour force, the demand for schools, amenities other facilities and future housing demand.

Table 4.2 provides the population by age cohort in the Study Area in 2011 and 2016. All but 2 of the age cohorts increased in population during the period. The 0-4 and 30-34 age brackets declined.

**Table 4.2: Age Profile of Study Area (CSO, 2011 & 2016)**

| Cohort | 2011 | 2016 | % Change 2011-2016 |
|---|---|---|---|
| 0-4 | 2043 | 1775 | -13.1% |
| 5-9 | 1730 | 1978 | +14.3% |
| 10-14 | 1481 | 1678 | +13.3% |
| 15-19 | 1299 | 1486 | +14.4% |
| 20-24 | 1350 | 1192 | -11.7% |
| 25-29 | 1883 | 1466 | -22.1% |
| 30-34 | 2097 | 1947 | -7.1% |
| 35-39 | 1950 | 2077 | +6.5% |
| 40-44 | 1640 | 1920 | +17.1% |
| 45-49 | 1404 | 1612 | +14.8% |
| 50-54 | 1199 | 1378 | +14.9% |
| 55-59 | 1015 | 1162 | +14.5% |
| 60-64 | 833 | 942 | +13.1% |
| 65-69 | 698 | 799 | +14.5% |
| 70-74 | 477 | 641 | +34.4% |
| 75-79 | 282 | 414 | +46.8% |
| 80-84 | 183 | 212 | +15.8% |
| 85+ | 139 | 178 | +28.1% |

### *4.2.3 Households*

Census 2016 reveals that there were approximately 7,759 households in the Study Area. In terms of house type, 86.2% were houses/bungalows and 12.5% were flats/apartments, with a small percentage of bedsits and mobile homes/caravans.

The average household size in the Study Area was 2.95 persons per household, slightly higher than the national average of 2.75 (in 2016).

Figure 4.2 below illustrates the distribution of households by size.

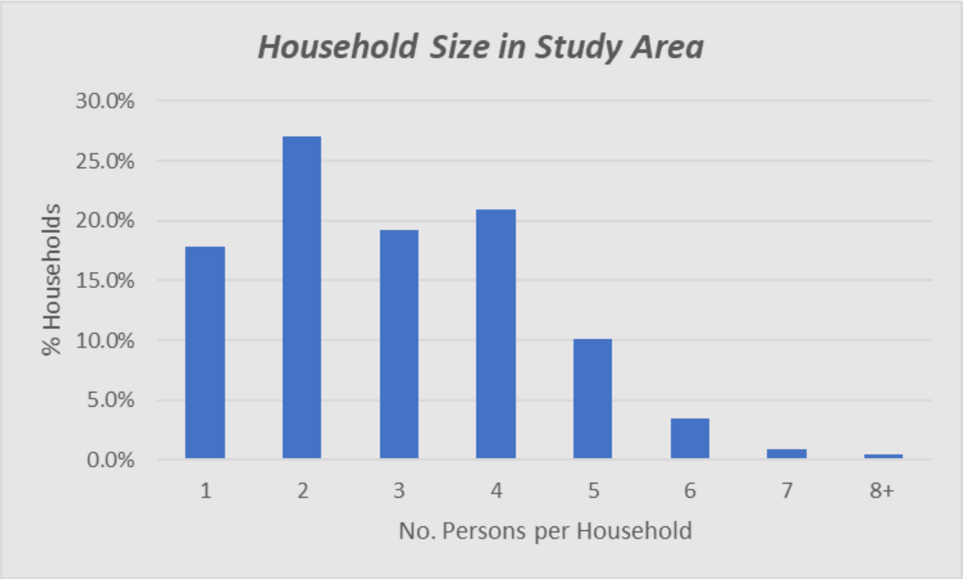


**Figure 4.2: Average Household Size in Study Area (Source: SCA from CSO 2016)**

In terms of occupancy type, 65% of households were owner occupied (with and without mortgage). 31% of dwellings were rented. Figure 4.3 illustrates the distribution of households by type of occupancy.

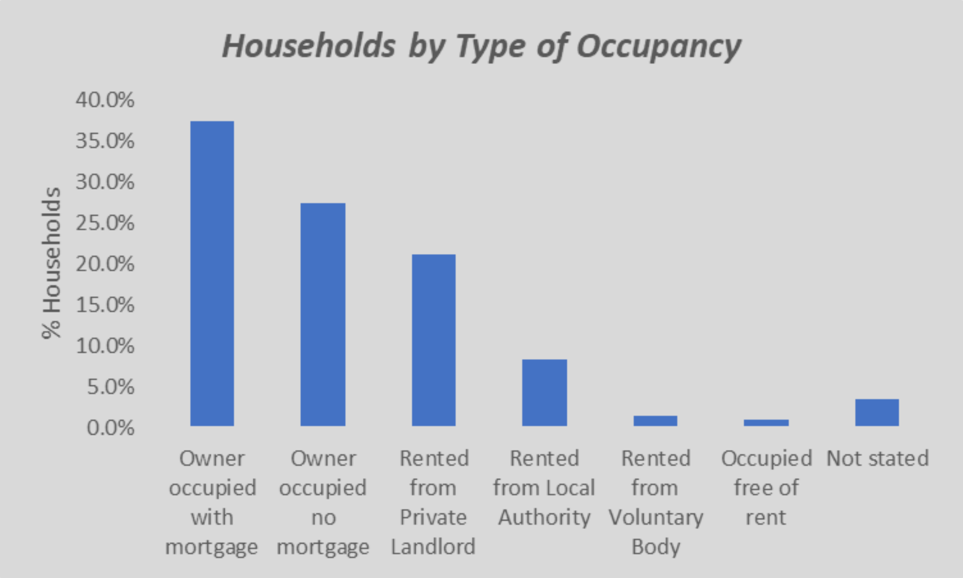


**Figure 4.3: Type of Occupancy within Study Area (Source: SCA from CSO 2016)**

In relation to the lifecycle of families in the Study Area, the most prevalent category in the family cycle was adult children (25%). There was a fairly even distribution between the other categories.

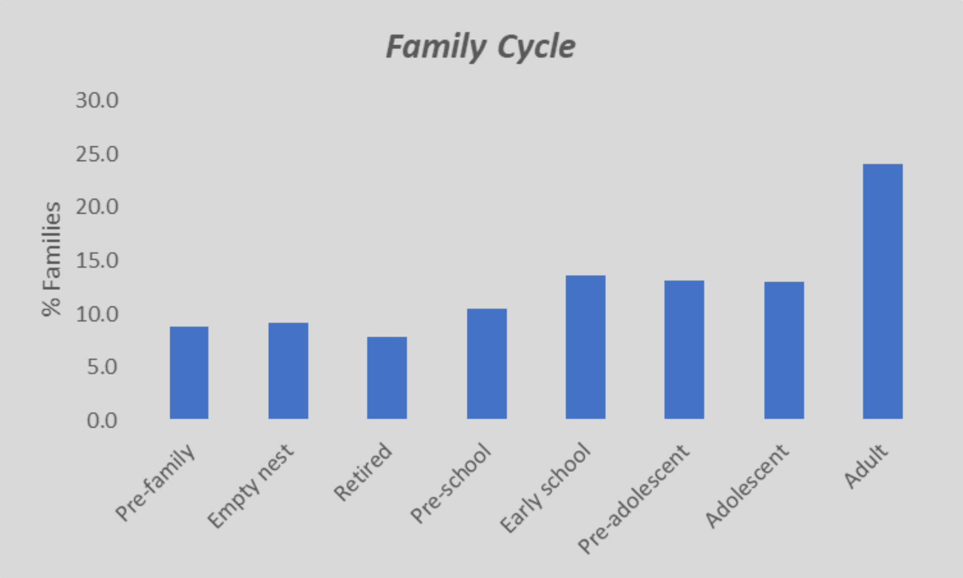


**Figure 4.4: Family Cycle within Study Area (Source: SCA from CSO 2016)**

### *4.2.4 Socio-Economics*

As illustrated in Figure 4.5 below, the most common social classes in the Study Area are ‘Managerial & Technical’ (25.5%) followed by ‘Non-Manual’ (21.4%).

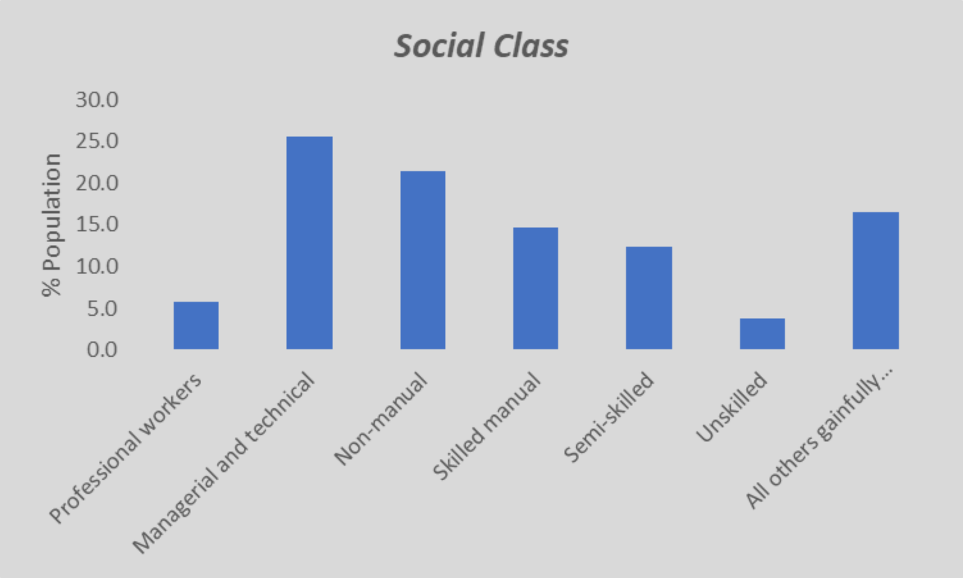


**Figure 4.5: Social Class within Study Area (Source: SCA from CSO 2016)**

### 4.2.5 *Travel Patterns*

For students travelling to school or college, the most popular modes of transport are ‘Car Passenger’ (40%) followed by ‘On Foot’ (37%). For employees, the dominant mode of transport is ‘Car Driver’ (59%).

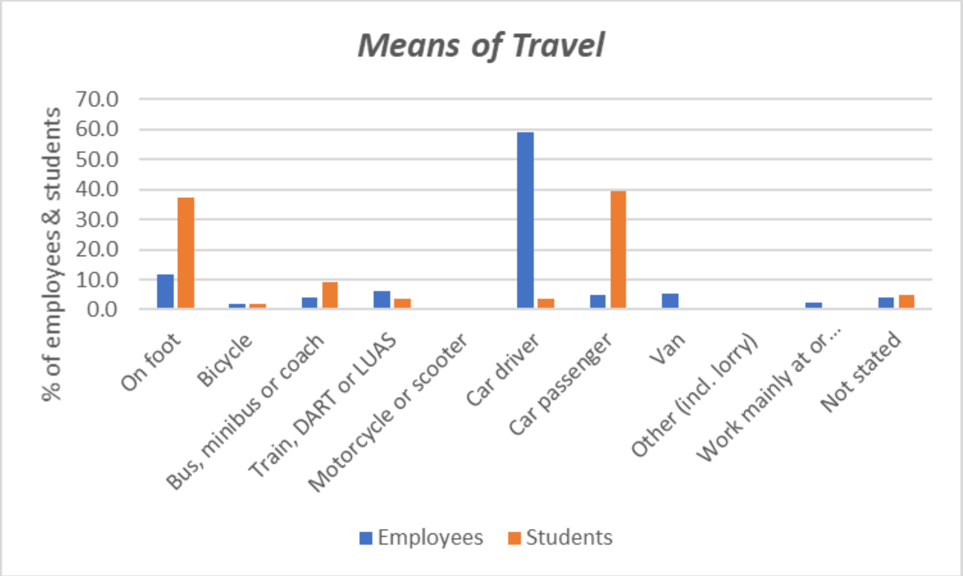


**Figure 4.6: Means of Travel within Study Area (Source: SCA from CSO 2016)**

### 4.2.6 *General Health*

In terms of the general health of the population of the Study Area, 87% were in Good or Very Good health.

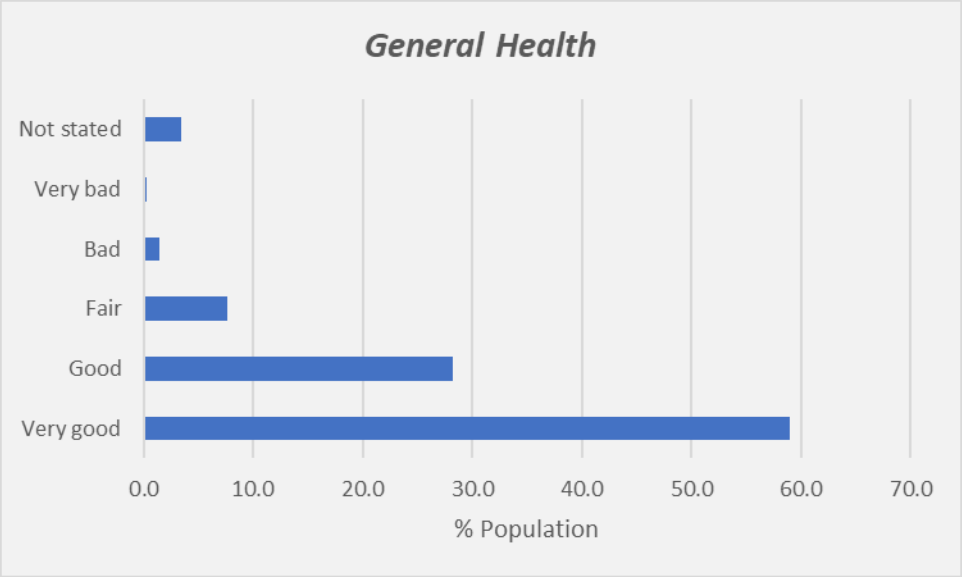


**Figure 4.7: General Health within Study Area (Source: SCA from CSO 2016)**

### *4.2.7 Employment & Economic Activity*

*Sources of Employment*

Newbridge serves as a major economic and employment centre in Co. Kildare. The 2016 Census reveals that 59% of respondents had a journey time of less than 30 minutes to their work or education, which indicates that the majority of employment and educational facilities are located relatively close by.

The 2016 Census data for the EDs in the Study Area shows that the industries which employ the greatest percentage of persons are:-

- Commerce and Trade (28%),
- Professional Services (20.5%)
- Manufacturing (12.7%).

*Economic Status of the Study Area*

The labour force consists of those who are able to work, i.e. those who are aged 15+, out of full-time education and not performing duties that prevent them from working.

Table 4.3 shows the percentage of the total population aged 15+ who were in the labour force during the 2016 Census. This figure is further broken down into the percentages that were at work, seeking first time employment or unemployed. It also shows the percentage of the total population aged 15+ who were not in the labour force, i.e. those who were students, retired, unable to work or performing home duties

**Table 4.3: Principal Status of Population aged 15+ (CSO, 2016)**

| | Status | State | Co. Kildare | Study Area |
|---|---|---|---|---|
| % of population aged 15+ who are in the labourforce | | 61.4% | 64.1% | 65.2% |
| % of which are: | At work | 87.1% | 88.6% | 85.9% |
| | First time job seeker | 1.4% | 1.3% | 1.7% |
| | Unemployed | 11.5% | 10.1% | 12.5% |
| % of population aged 15+ who are not in the labourforce | | 38.6% | 35.9% | 34.8% |
| % of which are: | Student | 29.4% | 33.9% | 29.1% |
| | Looking after family/home | 21.1% | 23.9% | 24.1% |
| | Retired | 37.6% | 31.1% | 33.7% |
| | Unable to work | 10.9% | 10.3% | 12.3% |
| | Other | 1.0% | 0.9% | 0.8% |

Overall, the principal economic status of those living in the Study Area was similar to that recorded at national and County level.

The *Kildare 2016 Census Profile Employment Industry and Occupations* notes that:-

- The labour force participation rate in Kildare was 64.1%, the fourth highest rate in the country.
- 88.6% of the labour force were 'At Work' in Kildare. This was the fifth highest rate in the country
- In 2016, the unemployment rate in Kildare was 11.4% (12,297 persons out of a labour force of 108,244). The national average unemployment rate was 12.9%.

*Employment by Socio-Economic Group*

Socio-economic grouping divides the population into categories depending on the level of skill or educational attainment required. Figure 4.8 shows the percentages of households in each socio-economic group[6] in the State, County Kildare and the Study Area during 2016.

---

[6] By Census reference person

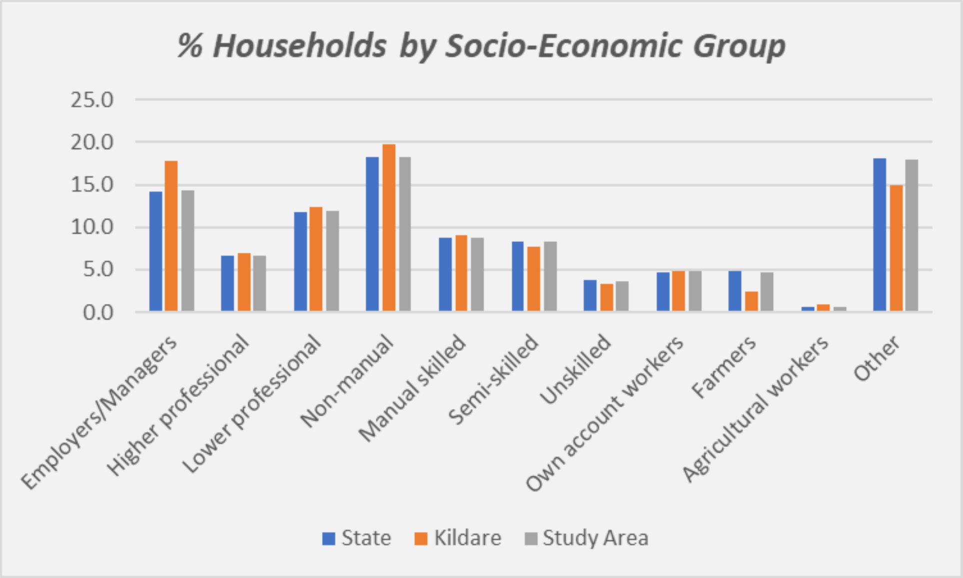


**Figure 4.8: Households by Socio-Economic Group (Source: SCA from CSO 2016)**

The results were broadly consistent at national, county and local levels. Non-Manual accounted for the highest number of households in the Study Area (18.3%) followed by Employers/Managers (14.3%) and Lower Professionals (11.3%).

The *Kildare 2016 Census Profile Employment Industry and Occupations* notes that:-

> *Kildare has the 2nd highest rate of Managers, directors and senior officials (9%) and the 3rd highest rate of Associate professional and technical occupations (13.1%). Both rates exceed the national average for each occupational group by a considerable margin and are reflective of a well-educated and highly skilled workforce.*

### *4.2.8 Land Use & Receptors*

A detailed description of the site and its context is contained in Chapter 2.

The sensitive population receptors in the area are the communities and properties identified below, and geographically presented on Figure 4.9:-

**Table 4.3: Sensitive Receptors**

| | |
|---|---|
| Residential | R1 – Detached dwellings along Standhouse Road<br>R2 – The Seven Springs residential development<br>R3 – The Elms residential development<br>R4 – Detached dwellings along Ballymany Road<br>R5 – Phase 1 of The Curragh Farm residential development (under construction)<br>R6 – Ballymany Manor residential development |
| Commercial | C1 – Keadeen Hotel |
| Community | CM1 – Scoil Mhuire Senior School |

**Figure 4.9: Receptors of Proposed Development**

## 4.3 Potential Impacts during Construction

The main likely significant effects of the project are as follows: -

### *4.3.1 Land Use*

The site will be hoarded off and inaccessible to the public. Construction activities will be confined to the site. Some level of construction activity is likely over a period of up to 5 years.

As there are no vehicular or pedestrian routes through the site, there will be no negative impacts on land use.

### *4.3.2 Population Change and Demographic Trends*

Some increase in population may arise during the construction period related to construction workers seeking accommodation. Such impacts will be short term, neutral and imperceptible.

### 4.3.3 *Economy*

The construction phase of the project will provide for the employment of a substantial number of construction workers over the construction programme. This will be a significant positive short-term impact in terms of employment and further indirect multiplier effects to the wider economy.

### 4.3.4 *Amenity and Human Health*

The construction phase of the project will cause a certain amount of loss of amenity, disruption, nuisance and inconvenience to the local community, particularly the residents who are located closest to the project including receptors at R1, R3 and R5 (when occupied). Potential effects on human health arising during the construction phase of the project relate generally to quality of life including air quality, climate, noise, water and hydrology, resource and waste management, potential disruption of services and the risk of major accidents/disasters. While the assessment of effects relating to each of these environmental factors are dealt with separately elsewhere in this EIAR, this section provides a summary as to how these effects have the potential to give rise to human health effects.

*Traffic*

As outlined in Chapter 12 (Material Assets: Roads & Traffic) of the EIAR, during the construction phase of the proposed development there will be increased vehicular movements associated with construction traffic. There may also be an increase in noise, and potentially dust, generated from construction related traffic which may cause disruption to people, groups or other activities located close to the proposed development. There will also be an increase in road traffic levels due to construction related activities supplying and accessing the site using the existing road network. Such impacts will be short-term and not significant.

*Water*

As outlined in Chapter 7 (Hydrology & Water) of the EIAR, during the construction phase of the proposed development the main potential impact in relation to the existing hydrology is the risk of pollution of surface water and groundwater due to elevated silt load as a result of construction activities and Hydrocarbons entering the surface water system as a result of an accidental spillage. Any effect on water quality has the potential to give rise to human health effects. Such incidents have the potential to have a significant temporary impact.

*Air Quality*

As outlined in Chapter 8 (Air Quality & Climate) of the EIAR, the construction phase involves a number of activities including soil disturbance, excavation, foundation operations, concrete operations, handling and storage of fine materials, and use of construction traffic and plant equipment. These activities generate particulate materials, including dust and PM10. The movement of machinery, construction vehicles and the use of plant equipment during the construction phase would also generate emissions of Sulphur Dioxide ($SO_2$), Nitrogen Oxides ($NO_x$), Particulate Matter (PM) and Carbon Monoxide (CO).

The overall impact on the existing air quality at the nearest receptors during the construction phase is predicted to be of a moderate - major negative impact. These impacts will be temporary and occur mainly during the initial site clearance work and preliminary build.

### *Noise & Vibration*

Chapter 9 (Noise & Vibration) of the EIAR notes that short-term noise impacts are likely to occur during the construction phase of the development due to the requirement to use heavy plant and machinery. The most common effects of excessive noise on people include annoyance, sleep disruption, health problems for vulnerable persons and general quality of life problems. It is anticipated that there would be a moderate impact, for limited periods of time, on the closest local residences within the vicinity of the development during construction.

There is potential for vibration impacts during the construction phase on account of the proximity of general construction activities to some of the nearest sensitive receptors and excavation works will be required as part of the construction works. Minor short-term vibration impacts may occur during the construction phase as a result of the use of heavy plant and machinery.

### *Waste (Construction & Demolition)*

The generation of waste during construction is considered in Chapter 12 (Material Assets: Waste Management) of the EIAR. Waste generated during the construction phase of the project will be segregated at source and disposed of appropriately. No potential negative effects on human health are likely.

### *Built Services*

Potential impacts on built services are considered in Chapter 12 (Material Assets: Built Services) of the EIAR. During the construction phase of the proposed development, it is proposed to underground any remaining overhead cables on the site. This will have a long-term positive impact.

Imperceptible impacts on the electricity supply network and water supply are predicted. There will be no construction impact on the existing gas supply.

### *Visual Impact*

Potential visual impacts on the surrounding population are considered in Chapter 10 (Landscape & Visual Impact) of the EIAR.

Landscape and visual effects during the construction stage will be experienced in the vicinity of the development site, from locations with views of the proposed development site and along the roads where construction traffic will travel.

The visual effects and their significance at construction phase will be temporary, adverse and range from minor to moderate in the wider study area, and moderate to major in the areas with proximity of the proposed developments site boundaries.

### *Accidents*

The construction of any project of this nature has potential to give rise to unplanned events or accidents, including fire, which impact on health and safety of human beings if such activities are not managed appropriately. Subject to adherence to best practice construction measures, such impacts are not considered to be likely or significant in this instance. A 'worst-case' scenario resulting from the construction of the development would be an accident leading to serious injury or death to a worker. However, the mitigation measures outlined should ensure that this should not occur.

Overall, the level of disturbance and impacts to human health are predicted to be commensurate with the normal disturbance associated with the construction industry where a site is efficiently and properly managed having regard to neighbouring activities. These negative impacts will be, cumulatively, significant but short term. Measures to address such human health considerations will be mitigated through the implementation of a Contractor's Construction Management Plan and will be subject to Regulations and the relevant Health and Safety codes.

## 4.4 Mitigation – Construction Phase

*C1 – Construction Management*

- In order to mitigate potential temporary community disturbance during construction, an *Outline Construction Management Plan* (OCMP) has been prepared and is included with the application. If the project is approved and implemented, the appointed contractor will incorporate the environmental commitments contained in this EIAR and prepare a detailed *Construction Management Plan* for the agreement of the Planning Authority prior to development commencing on site.

- Prior to the commencement of the works on site the contractor will prepare a detailed *Construction Traffic Management Plan* and agree the related proposals with the Planning Authority.

- The contractor will appoint a Liaison Officer to ensure that any issues from the local community are dealt with promptly and efficiently during construction. These details will be included in the Contractor's CMP prepared prior to construction commencing.

- Typically, construction working hours will be limited to 7.00 – 19.00 Monday to Friday and 8.00 to 14.00 on Saturday. It is anticipated that there will be times, due to exceptional circumstances, that construction work will be necessary outside these standard hours i.e. large concrete pours. Deviations from these standard times will be agreed in advance with the Planning Authority.

- Surface water runoff will be managed to prevent the flow of silt laden surface water entering nearby watercourses. Plant and machinery used for the works will be stored in a secure area and related fuel storage will be stored in a properly bunded area.

- Measures to mitigate dust emissions and air pollution will be carried out as outlined in Chapter 8 of the EIAR.

- In order to sufficiently reduce the likely noise and vibration impact, a schedule of noise control measures has been formulated for the construction phase of the proposed development as outlined in Chapter 9.

## 4.5 Residual Impacts during Construction

Subject to implementation of the mitigation measures outlined above, no significant negative impacts on population and human health are anticipated.

The development will have a significant short term positive impact on employment and the economy of Newbridge.

## 4.6 Potential Impacts during Operation

The main areas of impact are as follows:-

### *4.6.1 Land Use*

The project will deliver a new residential community with supporting land uses which will change the character of the existing landscape. This project may also act as a catalyst for further development / investment in the area and there is likely to be a positive impact on existing property and land values in the area. This change is consistent with planning policy and is a significant long-term positive effect.

### *4.6.2 Population*

The residential population of the proposed housing units will be in the order of 975 people. New residential units will contribute to the delivery of a critical mass of population which will support a wide range of additional local businesses, services, transport infrastructure and employment opportunities. The impact on the population is considered to be a long term significant positive effect

### *4.6.3 Economy*

The project will have a slight to moderate positive impact on the local economy through the direct employment in the childcare facility and indirectly in relation to support services to the new residential population. The increased population will also have an indirect positive impact on the local economy through its spending power.

### *4.6.4 Amenity and Human Health*

For the future residents, the living environment was carefully considered in the design process to ensure a high-quality scheme was designed in accordance with the relevant codes and guidance. The scheme meets all quantitative standards and the qualitative aspects of the scheme are demonstrated in the *Housing Quality Assessment* and other supporting documents submitted with the planning application such as the *Daylight & Sunlight Report*. The iterative design process has included introduction of design mitigation measures to improve the quality of residential units. The overall impact is considered to be long-term and positive, as the scheme will provide high quality residential accommodation.

The main impacts on human health, associated with air quality, noise, traffic and transportation and landscape, are considered elsewhere in this EIAR.

This section provides a summary as to how these effects have the potential to give rise to human health effects:-

*Traffic*

As outlined in Chapter 12 (Material Assets) there will be an increase in traffic on the surrounding road network following the completion of the proposed development, however the traffic analyses undertaken demonstrates that there is sufficient capacity within the existing road network to accommodate this increase and the related impact will be long-term and slight. The delivery of the section of the link road from the L7042 Green Road to the L7037 Standhouse Road will have a long-term positive impact.

*Noise*

As outlined in Chapter 9 (Noise & Vibration) it is not anticipated that there will be any adverse noise impacts on nearby sensitive receptors as a result of the operational phase of the proposed development, due to the nature of the activities which will be occurring there.

Residential housing estates, by their nature are typically low noise environments with the majority of noise emissions related to traffic movements within the estate. As all traffic within the boundaries of the proposed development will be subject to low speed limits which are commonly in place in such areas, it is not anticipated that this noise source will adversely affect the local noise environment or nearby noise sensitive receptors.

*Air Quality*

As outlined in Chapter 8 (Air & Climate), it is considered that the operational phase of the development will not have a significant negative impact on the local air quality or cause adverse impacts on human health.

*Water*

As outlined in Chapter 7 (Hydrology & Water), the main potential impact on surface water and ground water quality during the operational phase of the proposed development is the accidental spillage of oil or the lack of proper maintenance of the installed drainage systems. Such incidents have the potential to have a significant temporary impact.

*Landscape & Visual Impact*

As outlined in Chapter 10 (Landscape & Visual Impact) the retention of existing trees and hedgerow and the additional landscape works shall positively impact the landscape character of Ballymany and surrounding areas.

*Waste (Operational)*
No likely significant impacts on human health are predicted for the operational phase of the project. As outlined in Chapter 12 (Material Assets: Waste Management) the residents and non-residential users will be provided with suitable waste management facilities to safely dispose of their recycling and waste materials.

*Accidents*
The risk of accidents / unplanned events is addressed through the Building Regulations (Fire Safety) and is therefore addressed through primary mitigation in the design process. Residual risks of fire and road traffic accidents will be managed by emergency services as per their standard procedures.

Subject to implementation of the mitigation measures, the cumulative negative impacts of the development during the operational phase are typical of any urban development and are considered to be imperceptible to slight long term.

The development will have a significant positive long-term impact through the provision of quality housing and delivery of new road infrastructure benefitting the wider area.

## 4.7 Mitigation – Operational Phase

Mitigation measures relating to those factors under which population and human health effects might occur have been addressed elsewhere in this EIAR, under the relevant environmental factors. Other than the mitigation measures outlined these Chapters, no further mitigation measures have been proposed with respect to population and human health for the operational phase.

## 4.8 Monitoring

No monitoring measures are proposed with respect to population and human health.

## 4.9 Residual Impacts during Operation

Following the implementation of the mitigation measures outlined above, and elsewhere in this EIAR relating to human health, no significant negative residual effects are identified in respect of the project.

Long term significant positive impacts will come from the provision of high quality homes and strategic road infrastructure.

## 4.10 Cumulative Impacts

Significant developments in the vicinity of the site have been considered for potential cumulative impacts on population and human health.

Phase 1 of the permitted development on the site is currently under construction and comprises 54 no. dwellings. The remaining permitted development under ABP Ref. PL09.249038 comprises 226 residential units and a Nursing Home. The proposed development of 336 residential units is proposed in lieu of the remaining permitted development and will be a continuation of the project currently under construction.

A substantial residential development of 204 no. dwelling units has also been granted to the south of the Ballymany Road R445 under ABP Ref. 311040-21. That development will provide another section of the Link Road, which in combination with the current proposal will have a long-term significant and positive effect for Newbridge.

If this development is constructed simultaneously with the proposed development, there is potential for temporary moderate negative impacts on human beings as a result of increased construction traffic and disruption.

## 4.11 'Do-Nothing' Scenario

In the event that the proposed development does not proceed then it is likely that the extant planning permission on the lands (Kildare County Council File Number 16/658; ABP Reference PL09.249038) will be implemented. In such circumstances the likely impacts will be similar to the impacts identified for the subject development.

## 4.12 Worst Case Scenario

In the worst case scenario the site would remain undeveloped. In its current state as a disused quarry the site is of no value to human beings.

## 4.13 Interactions

Population and Human Health interactions are primarily linked to the environmental factors listed below. These interactions, and the impacts being considered, are identified in the relevant Chapters.

- Air Quality and Climate (Chapter 8)
- Noise and Vibration (Chapter 9)
- Landscape & Visual Impact (Chapter 10)
- Material Assets (Chapter 12)

# 5. BIODIVERSITY

## 5.1 Introduction

The Biodiversity chapter of this EIAR describes the existing ecological setting and potential effects on biodiversity associated with the construction phase and operational phase of the proposed development at Ballymany, Newbridge, Co. Kildare. The subject matter of Climate Change is also discussed. The assessment methodology, existing habitats, likely significant impacts and recommended mitigation measures are described in the following sections. The assessment addresses the potential impact of the proposed development upon biodiversity.

The scope of this study is to assess whether significant impacts on protected flora and fauna with a particular emphasises on protected species found within the proposed development and with cognizance for National Heritage Areas (NHAs) and to identify and/or mitigate any potential significant effects on protected species. This report has been prepared with regards to the European Communities (Natural Habitats) Regulations 1997 (S.I. No. 94 of 1997), and the later amendment regulations (S.I. No. 233 of 1998; S.I. No. 237 of 2005).

A study was undertaken by Dr Ross Donnelly-Swift who has a BSc (Hons) in Biology from Maynooth University NUI, an MSc in Environmental Science from Trinity College Dublin and a PhD in Biosystems Engineering from University College Dublin. In addition, Ross was a Research Fellow in the Geography Department of Trinity College Dublin and Lecturer on Soil Science and Hydrology at Dundalk Institute of Technology. The site assessment comprised a review of the proposed development, a site assessment on the 6th of August 2020 and a follow up survey on the 14th of January 2022 to examine the ecological context of the proposed development, a desk study of the information on protected species, habitats and sites within the vicinity of the development for the potential impacts.

## 5.2 Legislative Context

The following legislation is relevant to the proposed development and biodiversity:

- The Wildlife Act is the primary piece of Irish legislation providing for the protection and conservation of wildlife and provides for the control of specific activities which could adversely affect wildlife, for example the regulation of hunting and wildlife trading. Under the Wildlife Act, all bird species, 22 other fauna species and 86 flora species in Ireland are afforded protected status. The Wildlife Act, 1976 allows for the designation of specific areas of ecological value such as Statutory Nature Reserves and Refuges for Fauna. The Wildlife (Amendment) Act, 2000 provides for greater protection and conservation of wildlife and also provides for the designation and statutory protection of Natural Heritage Areas (NHA).European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. No. 477 of 2011) and (Amendment) Regulations, 2015 (S.I. No. 355 of 2015), transposing the Habitats Directive 92/43/EEC (as amended) and Birds Directive 2009/147/EC.

- The Flora (Protection) Order, 2015 (S.I. No. 356 of 2015). This order provides statutory protection to flora listed in Section 21 of the Wildlife Act, 1976 and Wildlife (Amendment) Act, 2000. Under the Order, it is illegal to wilfully cut, uproot or damage the listed species or interfere in any way with their habitats.

- National Biodiversity Plan 2017-2021. Ireland's third National Biodiversity Plan 2017–2021, identifies actions towards understanding and protecting biodiversity with a vision that, "*biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally*". A number of Local Biodiversity Action Plans have been prepared, and it is noted that the Kildare County Development Plan (CDP) includes a policy to carry out a Biodiversity Plan during the lifetime of the CDP.

- European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. 477 of 2011). These regulations transpose the European Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora (known as the "Habitats Directive") and the European Council Directive 2009/147/EC on the Conservation of Wild Birds (known as the "Birds Directive") into Irish Law. The regulations provide for the designation and protection of Natura 2000 sites comprising of Special Areas of Conservation (SAC) and Special Protection Areas (SPA). The regulations safeguard the SAC and SPA sites from developments with the potential to significantly impact upon them. The EC (Birds and Natural Habitats) Regulations also address invasive species, making it an offence without a licence to plant, allow to disperse, escape or spread, to reproduce or propagate, to transport, to sell or advertise invasive species specified in the regulations.

- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. 272 of 2009). The regulations give statutory effect to Directive 2008/105/EC and provide legal status to quality objectives for all surface waters and environmental quality standards for pollutants. The regulations allow for the classification of surface waters by the Environmental Protection Agency (EPA) in accordance with the ecological objectives approach of the Water Framework Directive. The regulations also provide for the establishment of inventories of priority substances by the EPA and the preparation of pollution reduction plans.

- Water Framework Directive (2000/60/EC). The Water Framework Directive (WFD) aims to improve the water environment (including groundwater, rivers, lakes, estuaries and coastal waters) of E.U. Member States. The aim of the WFD is for Member States to achieve and maintain "good status" in all water bodies.

- Kildare County Development Plan 2017-2023. Under these regulations, development plans must include mandatory objectives for the conservation of natural heritage and for the conservation of European sites.

## 5.3 Methodology

The following guidance documents have been consulted for this assessment:

- *Appropriate Assessment of Plans and Projects in Ireland. Guidelines for Planning Authorities*. DoEHLG, 2009.
- Ecological Guidance for Local Authorities and Developers (Scott Cawley, 2013)
- *Managing Natura 2000 sites – The Provisions of Article 6 of The Habitats Directive 92/43/EEC.* European Commission, 2000.
- NRA (2009) *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (National Roads Authority)
- *Assessment of Plans and Projects Significantly Affecting Natura 2000 sites. Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.* European Commission, 2002.
- Commission Notice "Managing Natura 200 sites The provisions of Article 6 of the Habitats Directive 92/43/EEC. European Commission, 21.11.2018
- CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal*, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester.
- Expedition Field Techniques: Bird Surveys (Bibby et al., 2000);
- Bird census and survey techniques (Gregory et al., 2004);
- Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn.) (Collins 2016);
- Bat Mitigation Guidelines for Ireland (Kelleher and Marnell, 2006);
- Bats and artificial lighting in the UK (Bat Conservation Trust, 2018);
- Bats & Lighting: Guidance Notes for Planners, Engineers, Architects and Developers (Bat Conservation Ireland, 2010).
- *The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads* (National Roads Authority (NRA), 2010);
- *Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes* (NRA, 2006a);
- *Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes* (NRA, 2006b);
- *Guidelines for the Treatment of Bats during the Construction of National Road Schemes* (NRA, 2006c);
- *Bat Mitigation Guidelines for Ireland* (Kelleher and Marnell, 2006);

Following guidance set out by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018) and the National Roads Authority (2009), a Zone of Influence should be determined, which identifies the area in which the development could potentially impact upon ecological receptors and aquatic environments. The zone of influence takes into consideration the assigned ecological value of the receptors, which ranges from international, national, county to local, and potential pathways for impacts to occur. The zone of influence also takes into consideration the watercourse surrounding the proposed development. Taking into consideration best practice guidance and the nature of the development, the study area for the assessment ranges from the site boundary for habitats, to buffers of 100m for specific species. However, it should be noted that these buffers were extended where required.

### *5.3.1 Desktop Research*

Every effort has been made to provide an accurate assessment of the situation pertaining to the site. However, an ecological survey can only assess a site at a particular time and is limited by various factors such as the season, timing of the survey, climatic conditions and species behaviour. Ecological surveys are therefore snapshots in time and should not be regarded as a complete study. Direct observations or evidence of protected species is not always recorded during ecological surveys. However, this does not indicate that the species is absent from the site. To ensure any limitations encountered did not significantly impact upon the findings of the ecological assessments, the ecological surveys undertaken also assessed the potential of the habitats to support protected species, and cognisance has been taken of available online baseline data (e.g. flora and fauna records from the NBDC, consultation with NPWS regarding protected / threatened species, consultation with BCI regarding bat roost records, previous surveys undertaken by Wildlife Surveys) and a precautionary approach taken.

Desktop research was carried out to gather information on the ecology of the site and surrounding areas. The locations of the Natura 2000 sites, National Heritage Areas (NHAs) and protected flora and fauna records for the proposed development at Ballymany, Newbridge, Co. Kildare. Various mapping websites, including EPA Envision, Google Maps and OSI.

Water quality data from the EPA was reviewed for the assessment of biological and environmental data collected on waterbodies in Ireland (Water Quality in Ireland 2013-2018 (2019)).

Biological records from the National Biodiversity Data Centre (NBDC) for the site and surrounding area (10km grid square/tetrad) were reviewed and account taken of notable species including any rare, protected, threatened and invasive species.

In addition to the above, the NPWS was contacted on the 13th of December 2021 in relation to records for sensitive, rare, threatened and protected species within 10km of the development location. Results are contained further within this report.

Information on the characteristics of the Natura 2000 sites within the potential zone of influence was reviewed from the conservation objectives documents, site synopses and Standard Natura 2000 data forms available on the NPWS website.

In addition, a stage 2 appropriate assessment has been undertaken and a Natura Impact Statement (NIS) provided for the proposed development (Document Ref: PES_NIS_20_9794R1). This NIS took into consideration the locations of the Natura 2000 sites within 15km of the proposed development. An assessment of the potential impacts on the habitats and species of the following sites; Pollardstown Fen SAC, Mouds Bog SAC and the River Barrow and River Nore SAC. Mitigation measures have been proposed to avoid any significant impact on these protected sites.

### *5.3.2 Field Survey*

A site characterisation assessment was undertaken on the 6th of August 2020 and the 14th of January 2022 to examine the ecological context of the development site, by systematically walking the site, adjacent land and boundaries and determining the habitats present. The habitat survey was undertaken in accordance with the standard methodology outlined in Fossitt's "*A Guide to Habitats in Ireland*", a hierarchical classification scheme based upon the characteristics of vegetation present. The Fossitt system also indicates when there are potential links with Annex I habitats of the E.U. Habitats Directive (92/43/EEC). Cognisance was also taken of the Heritage Council guidelines, "*Best Practice Guidance for Habitat Survey and Mapping*", (Smith *et al.,* 2011).

Bird species and signs of fauna activity and dwellings were also noted. Particular attention was given to the possible presence of habitats and/or species, which are legally protected under Irish and European legislation and to assessing any potential ecological connectivity with Natura 2000 sites or supplementary or steppingstone habitats of relevance to Natura 200 sites.

General bird usage of the development site was assessed on the 6th August 2020 and 14th January 2022. While walking the development site, stops were undertaken on a regular basis during which time the area was scanned as far as the terrain or weather conditions allowed. Birds were identified by visual sightings and auditory identification of songs and calls. Birds flying overhead were also included as part of the survey.

#### ***Survey Limitations***

Every effort has been made to provide an accurate assessment of the situation pertaining to the site. However, an ecological survey can only assess a site at a particular time and is limited by various factors such as the season, timing of the survey, climatic conditions and species behaviour. Ecological surveys are therefore snapshots in time and should not be regarded as a complete study. Direct observations or evidence of protected species is not always recorded during ecological surveys. However, this does not indicate that the species is absent from the site.

The optimal habitat survey period runs from April to September, the growing season for the majority of plants (Smith *et al.*, 2011). To ensure any limitations encountered did not significantly impact upon the findings of the ecological assessments, the ecological surveys undertaken also assessed the potential of the habitats to support protected species, and cognisance has been taken of available online baseline data (e.g. flora and fauna records from the NBDC, consultation with NPWS regarding protected / threatened species, reviewing previous surveys undertaken by Wildlife Surveys) and a precautionary approach taken. A survey undertaken on the 14th January 2022 was included as a winter/early spring survey is useful to determine the presence of spring flora and if any changes to the hydrology of the site with an emphasis observational flow rates of drainage ditches.

### 5.3.3 *Bat Survey*

Areas within the proposed development site at the Ballymany with the potential to support bat roosts and / or foraging / commuting routes, and which have the potential to be impacted upon by the proposed development were the main focus of this survey.

A daytime assessment of individual trees, treelines and hedgerows within the proposed development site potentially affected by the proposed development was undertaken on the 6th of August 2020.

The assessment comprised of an external inspection of trees to identify potential roost features (PRFs) and evidence of bat activity. The criteria used to categorise the PRFs or suitability of trees as a potential roost are summarised in the table below, based upon the guidelines by Collins (2016) and Hundt (2012).

**Table 5.1: Bat Roost Potential Categories**

| CATEGORY | DESCRIPTION |
|---|---|
| **High**<br>Trees that are suitable for use by large numbers of bats on a regular basis | Features include holes, cracks or crevices that extend or appear to extend back to cavities suitable for bats. In trees, examples include hollows and cavities, rot holes, cracks/splits and flaking or raised bark which could provide roosting opportunities. Any ivy cover is sufficiently well-established and matted so as to create potential crevices beneath.<br>**Further survey work would be required to determine whether or not bats are present, and if so, the species present. Appropriate mitigation and potential licensing requirements may then be determined.** |
| **Moderate**<br>Moderate potential is assigned to trees with potential to support bat roosts but supports fewer features than a high potential tree and is unlikely to support a roost of high conservation value. | From the ground, tree appears to have features (e.g. holes, cavities, cracks or dense ivy cover) that may extend back into a cavity. However, owing to the characteristics of the feature, they are deemed to be sub-optimal for roosting bats.<br>**Further survey work would be required to determine whether or not bats are present, and if so, the species present. Appropriate mitigation and potential licensing requirements may then be determined.** |
| **Low**<br>Low potential is assigned to trees with features that could support individual bats opportunistically. | If no features are visible, but owing to the size, age and/or structure, hidden features, sub-optimal for roosting bats, may occur that only an elevated inspection may reveal. In respect of ivy cover, this is not dense (i.e. providing PRF in itself) but may mask presence of PRF features.<br>**Works may proceed using reasonable precautions (e.g. controlled working methods, under license or supervision of a bat worker).** |

Two surveys, an evening (dusk) and a dawn survey, were undertaken on the 16th and 17th August 2020 by ecologist Sean Meehan. The survey on the 16th August was a dusk survey and commenced at 20.18 (30 minutes before sunset) and was two and a half hours in duration, finishing at 22.48. The survey on the 17th August was a dawn survey and commenced at 04.15 (two hours before sunrise) and was two and half hours in duration, finishing at 06.45. A handheld +EM3 bat detector and an etrex GPS device were used. See accompanying Bat Survey report by Meehan Ecology Ltd. for detailed results.

## 5.4 Description of Proposed Development & Existing Site

### *5.4.1 Proposed development*

The proposed development site, measuring approximately 11.4ha, is located in the town of Newbridge (within the town limit) along the R445 road as shown in the location map included as Figure 5.1 below. It will comprise of the construction of a mixed residential development The development is within the local area plan boundary of Newbridge and will comprise of the construction of a mixed residential development of 336 units comprising of 245 no. two storey houses, 27 no apartments, within one building and 64 no. duplex units arranged in 6 no. 2 & 3 storey buildings. A childcare facility is also proposed as a stand-alone 2 storey building to serve the development. The total site area is 11.4ha. This includes car parking spaces, bicycle parking and green spaces, internal roads, pumping station, landscaping, boundary treatments and all associated site development works. In addition to footpath improvements along Standhouse Road. The heating system of the residential development will be Air to Water heat pumps. Vehicular access will be from the R445 road (as permitted under Ref.16/658). Junction 12 of the M7 motorway is approximately 760m to the south-west of the proposed development. The Curragh is designated as a proposed National Heritage Area (pNHA) (Site Code 000392) and is located approximately 810m west of the proposed site. The River Liffey is approximately 1.8km to the east of the proposed development site.

The northern section of proposed development site has been in use as agricultural land (tillage) and the southern half has been an area of gravel and sand for over 10 years as shown imagery captured in 2009 and 2020, see Figure 5.2 below.

The surface water drainage system designed by the engineering consultants MUIR associates will consist of a drainage pipe network with inspection holes, tapped gullies and attenuation areas with geotextile layers and hydrocarbon treatment capabilities located within the proposed development. The runoff from the roof areas is considered to be clean runoff, free from silt and other contaminants while potential silts and hydrocarbons from the road network will be captured within the drainage system. Foul water will connect to the existing public sewer network along the R445 and connect with the local WWTP. A section of hedgerow will be removed along the north boundary with Standhouse as permitted under Planning Ref. 16/658. No hedgerow will be removed along the north boundary of the properties along Standhouse road.

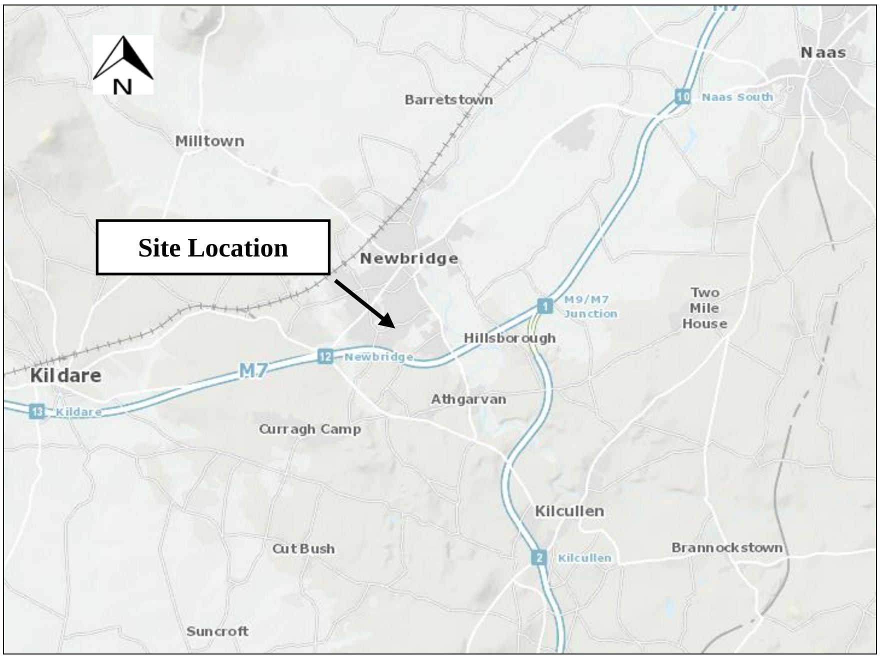


Figure 5.1: Location of Proposed Development at Ballymany, Newbridge, Co. Kildare

Figure 5.2: The Overall Development Site (Phase 1 and Phase 2) (i) 2020 and (ii) 2009 (Source Google Imagery)

**Figure 5.3: Development Site of Subject SHD Application (Source Google Imagery)**

### *5.4.2 Existing Environment*

During the site survey eleven habitats were identified during the site assessment on the 6th of August 2020 as detailed below. During the site assessment on the 14th of January 2022 no additional habitats were noted with much of site now consisting of exposed sand, gravel and till (ED1) and spoil and bare ground (ED2). There were no High Impact invasive species recorded within the site. See Appendix B for Photo Log of site assessment on the 14th of January 2022.

**Recolonising bare ground (ED3)**

A dominant habitat found at the proposed development is recolonising bare ground (ED3). The dominant species found here are Ragwort (*Senecio jacobaea*), Spear Thistle (*Cirsium vulgare*), Creeping Buttercup (*Ranunculus repens*) and Dock (*Rumex* spp.). Other flora found here include Creeping Thistle *(Cirsium arvense*), Hogweed (*Heracleum sphondylium*), Lesser Burdock (*Arctium minus*), Ribwort Plantain (*Plantago lanceolata*), Colt's Foot (*Tussilago farfara*), Common Figwort (*Scrophularia nodosa*), Weld (*Reseda luteola*), Rosebay Willowherb (*Chamerion angustifolium*), Ox-eye Daisy (*Leucanthemum vulgare*), Poppy (*Papaver* spp.), Nettle (*Urtica dioica*), Hedge Mustard (*Sisymbrium officinale*), Lesser Hawkbit (*Leontodon taraxacoides*), Greater Plantain (*Plantago major*), Dandelion (*Taraxacum* spp.) and Yarrow (*Achillea millefolium*).

**Figure 5.4: Recolonising bare ground (ED3)**

## Hedgerows (WL1)

Along the northern and eastern boundary of the development site is hedgerow (WL1) habitat with tree species such as Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*), Blackthorn (*Prunus spinosa*), Hawthorn (*Crataegus monogyna*), Elder (*Sambucus nigra*), Elm (*Ulmus* sp.), and Oak (*Quercus* spp.). Other species commonly found in this habitat are Bramble (*Rubus fruticosus*), Cow Parsley (*Anthriscus sylvestris*), Dog-rose (*Rosa canina agg.*), Herb-Robert (*Geranium robertianum*), Cherry Laurel (*Prunus laurocerasus*), Ivy (*Hedera helix*), Cleavers (*Galium aparine*), and Nettle (*Urtica dioica*).

**Figure 5.5: Hedgerows (WL1)**

## Treelines (WL2)

Along the western boundary is treelines (WL2) habitat. This will contain the tree species found in WL1, additional species includes Copper Beech (*Fagus sylvatica f. purpurea*), Leyland Cypress (*Cuprocyparis leylandii*), Willow (*Salix* spp.), Scot's Pine (*Pinus sylvestris*) and Sitka Spruce (*Picea sitchensis*). Notable mature Oak (*Quercus* spp.) specimens are found along the western boundary. Monkey Puzzle (*Araucaria araucana*) is found in a neighbouring property to the east.

**Figure 5.6: Treelines (WL2)**

### Dry meadows and grassy verges (GS2)

This habitat is present at the site. Flora species found here include grasses such as Ryegrasses (*Lolium* spp.), as Cock’s-foot (*Dactylis glomerata*), Bent grasses (*Agrostis* spp.) and Meadow-grasses (*Poa* spp.). Frequent species include Dandelion (*Taraxacum* spp.), Dock (*Rumex* spp.), Spear Thistle (*Cirsium vulgare*), Greater Plantain (*Plantago major*) Common Vetch (*Vicia sativa* ssp. *segetalis*), Common Knapweed (*Centaurea nigra*), Daisy (*Bellis perennis*), Speedwell (*Veronica* spp.) and Nettle (*Urtica dioica*).

**Figure 5.7: Dry meadows and grassy verges (GS2)**

### Buildings and artificial surfaces (BL3)

The road into the development site and construction prefabs are classified as buildings and artificial surfaces (BL3) habitat with few flora species present such as Groundsel (*Senecio vulgaris*) and Dandelion (*Taraxacum* spp.).

Figure 5.8: Buildings and artificial surfaces (BL3)

### Scrub (WS1)

This habitat is found within the site at various points. Flora species include are Grass spp, Gorse (*Ulex europaeus*), Bramble (*Rubus fruticosus*), Willow (*Salix* spp.), Dock (*Rumex* spp.) and Rosebay Willowherb (*Chamerion angustifolium*).

Figure 5.9: Scrub (WS1)

### Other artificial lakes and ponds (FL8)

A small pond found at the southern end of the site is classified as other artificial lakes and ponds (FL8) habitat. With Bulrush (*Typha latifolia*), Silverweed (*Potentilla anserina*), Horsetail (*Equisetaceae* agg.) and Soft Rush (*Juncus effusus*).


Figure 5.10: Other artificial lakes and ponds (FL8)

### Ornamental/non-native shrub (WS3)

Along the R445 road boundary is an area of ornamental/non-native shrub (WS3) habitat. Flora found here includes Silverleaf cotoneaster (*Cotoneaster Pannosus*) and Spreading cotoneaster (*Cotoneaster divaricatus*).


Figure 5.11: Ornamental/non-native shrub (WS3)

### Exposed sand, gravel and till (ED1) and spoil and bare ground (ED2)

These habitats can be found at the southern part of the site. Species found here are similar to ED3 and WS1 with the addition of Willow (*Salix* spp.) Butterfly-bush (*Buddleja davidii*) and Birch (*Betula* spp.).

**Figure 5.12: Exposed sand, gravel and till (ED1) and spoil and bare ground (ED2)**

## Earth banks (BL2)

This habitat along the east and west boundaries of the site with similar flora to GS2 but also found here is Bramble (*Rubus fruticosus*), Creeping Cinquefoil (*Potentilla reptans*), Lesser Burdock (*Arctium minus*), Willowherb (*Epilobium* spp.), Sow-thistle (*Sonchus* spp.), Spear Thistle (*Cirsium vulgare*), Yarrow (*Achillea millefolium*), Ragwort (*Senecio jacobaea*), Broad-leaved Dock (*Rumex obtusifolius*), Clover (*Trifolium* spp.), Tutsan (*Hypericum androsaemum*), Creeping Buttercup (*Ranunculus repens*) and Common Chickweed (*Stellaria media*)

**Figure 5.13: Earth banks (BL2)**

**Table 5.2: Habitats found in and along boundary of the development site**

| HABITAT CLASSIFICATION HIERARCHY | | |
|---|---|---|
| **LEVEL 1** | **LEVEL 2** | **LEVEL 3** |
| **B** – Cultivated and built land | **BL** – Built Land | **BL2** - Earth Banks |
| | | **BL3** – Buildings and artificial surfaces |
| **E** – Exposed rock and disturbed ground | **ED** – Exposed rock | **ED1** - Exposed sand, gravel and till |
| | | **ED2** – Spoil and bare ground |
| | | **ED3** – Recolonising bare ground |
| **F** – Freshwater | **FL** – Lakes and ponds | **FL8** – Other artificial lakes and ponds |
| **G** – Grassland and marsh | **GS** – Semi-natural grassland | **GS2** - Dry meadows and grassy verges |
| **W** – Woodland and scrub | **WS** – Scrub / transitional woodland | **WS1** - Scrub |
| | | **WS3** - Ornamental/non-native shrub |
| | **WL** – Linear woodland / scrub | **WL1** – Hedgerows |
| | | **WL2** – Treelines |

**Table 5.3: Ecological Value of Identified Habitats at the Proposed Development**

| HABITAT TYPE | HABITAT RATING | KEY ECOLOGICAL RECEPTOR? |
|---|---|---|
| Other artificial lakes and ponds (FL8) | Local importance, lower value | No. Mainly small in extent with limited volume. Low ecological value. |
| Dry meadows and grassy verges (GS2) | Local importance, lower value | No. Species poor habitat. Low ecological value. |
| Scrub (WS1) | Local importance, lower value | No. The majority of this habitat is made up of Gorse. |
| Ornamental/ non-native shrub (WS3) | Local importance, lower value | No. Modified habitat, low ecological value. |
| Hedgerows (WL1) | Local importance, lower value | Yes. Area of semi-natural habitat, comprising mainly of native species. May provide opportunities for bird nesting and foraging for bats. |
| Treelines (WL2) | Local importance, lower value | Yes. Area of semi-natural habitat, comprising of native and non-native species. May provide opportunities for bird nesting. Foraging bats recorded here with potential for roosting. |
| Exposed sand, gravel and till (ED1) | Local importance, lower value | No. Modified habitat, low ecological value. |
| Spoil and bare ground (ED2) | Local importance, lower value | No. Modified habitat, low ecological value. |
| Recolonising bare ground (ED3) | Local importance, lower value | No. Modified habitat, low ecological value. |

| HABITAT TYPE | HABITAT RATING | KEY ECOLOGICAL RECEPTOR? |
|---|---|---|
| Earth Banks (BL2) | Local importance, lower value | No. Modified habitat, low ecological value. |
| Buildings and artificial surfaces (BL3) | Local importance, lower value | No. Comprised of access road and prefabs, low ecological value. |

### 5.4.3 *Habitats Surrounding the Proposed Development*

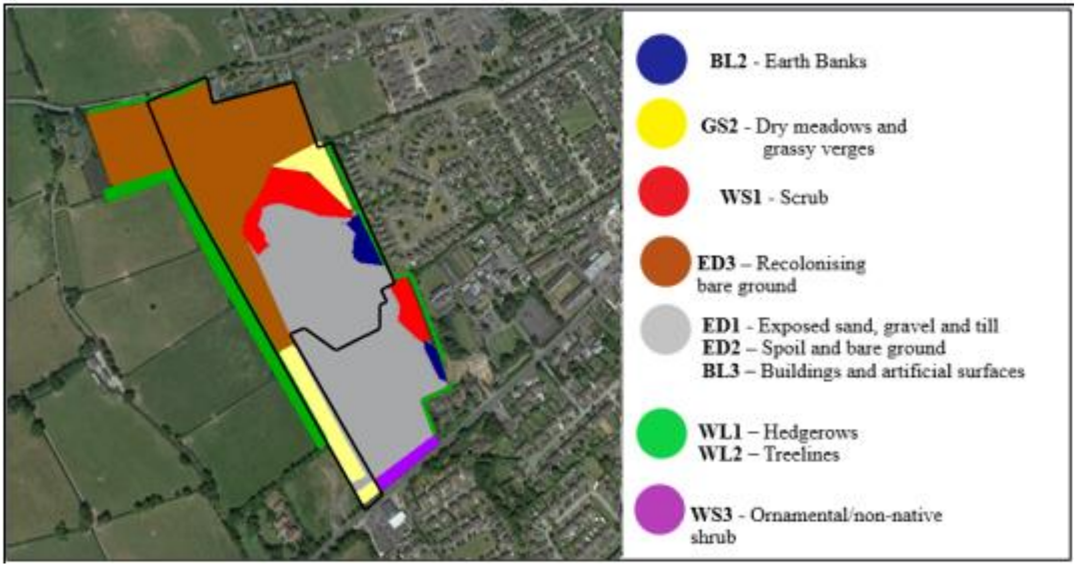


**Figure 5.13: Habitat Map (Phase 2 site indicated by black line boundary)**

**Improved agricultural grassland (GA1)**

The adjacent fields to the west of the proposed development consist of agricultural grassland for livestock such as horses.

**Buildings and Artificial surfaces (BL3)**

To the east is the town of Newbridge with both commercial, amenity and residential buildings.

**Dry-humid acid grassland (GS3)**

Further west is the Curragh Plains which are an extensive expanse of semi-natural grassland approximately 200 km$^2$ predominately in use for sheep grazing. It is also of considerable hydrogeological importance due to the existence the Curragh aquifer, which is the largest gravel aquifer in Ireland and whose discharge feeds major springs to Pollardstown Fen (Misstear and Brown 2008).

**Rich fen and flush (PF1)**

Pollardstown Fen is located to the north of the proposed development. The area of the Fen is 220 hectares with species such as Great Fen-sedge (*Cladium mariscus*), Common Reed (*Phragmites australis*), Blunt-flowered Rush (*Juncus subnodulosus*) and a variety of sedges (*Carex* spp.).

**Depositing/lowland rivers (FW2)**
The River Liffey flows through the town of Newbridge to the east of the proposed development.

**Canals (FW3)**
The Grand Canal (Milltown feeder) flows from Pollardstown Fen.

During the site assessment no protected flora were recorded within or along the boundary of the site. In addition to the site walkover, flora records were reviewed on the National Biodiversity Data Centre (NBDC) website for the proposed development site and vicinity. No protected flora species under the Flora Protection Order 2015 (S.I. No. 356 of 2015), were recorded for the 10km square (Tetrad - N71) in which the development site is located. Threatened species recorded were Blue Fleabane (*Erigeron acer*) and Tea-leaved Willow (*Salix phylicifolia*).

### *5.4.4 Hydrologic Connectivity*

The proposed development is located within the Barrow Catchment (ID 14) and Liffey and Dublin Bay Catchment (ID 09). Watercourses located near the proposed development are Cloncumber Stream (EPA Code 14C17, Order 2). Rosberry 14 (EPA Code: 14R08, Order 1), River Liffey (EPA Code: 09L01, Order 6) and the Grand Canal (Milltown Feeder). The Grand Canal connects with Pollardstown Fen as does the Cloncumber Stream and Rosberry 14. Pollardstown Fen has approximately 40 springs that supply water to it. See Figure 5.14 for watercourses relative to the proposed development. Protected aquatic habitats and species are summarised in Section 4.4 below.

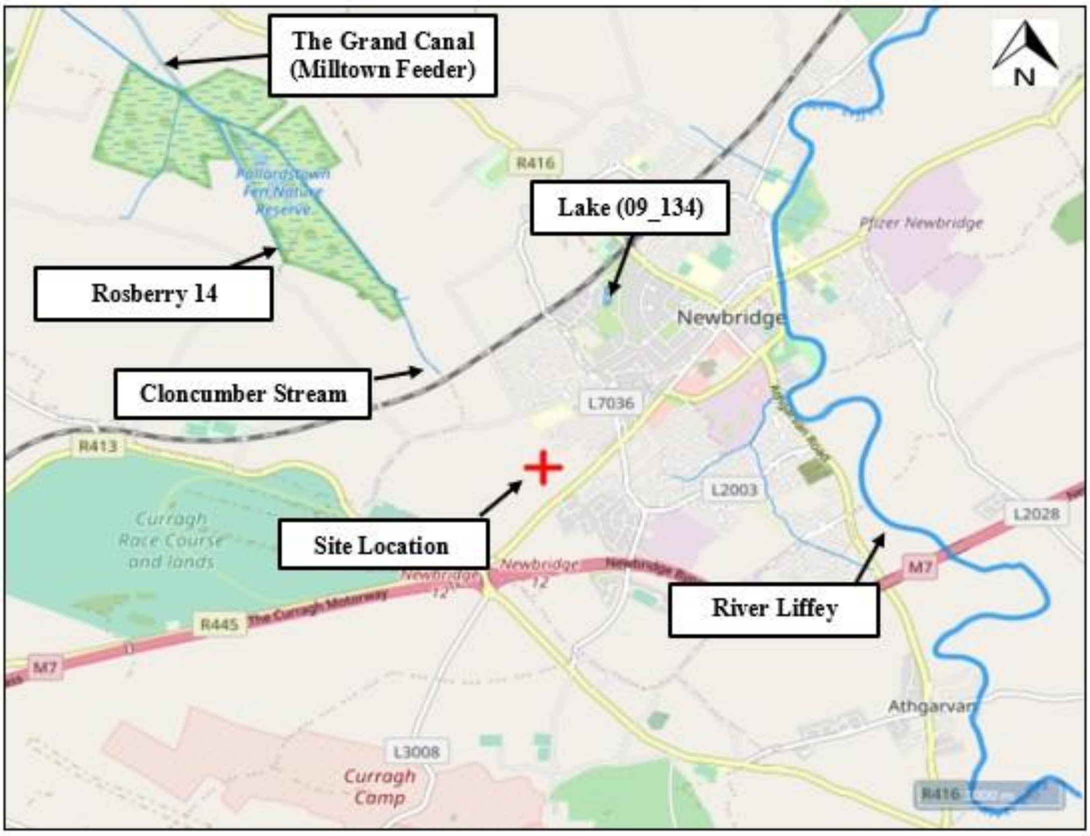


**Figure 5.14: Watercourses within vicinity of the proposed development**

The Environmental Protection Agency (EPA) undertake surface water monitoring along the River Liffey and Cloncumber Stream. The results for the nearest monitoring stations with available information (as per Table 5.4) for the period 2000 – 2019 are summarised in Figure 5.15 below for indicative purposes. As can be seen in Figure 5.15 below, the River Liffey is mainly achieving a water quality status of between Q4 (good) and Q4.5 (high) in recent years. The Cloncumber Stream is achieving a status of Q3 (poor) and Q4 (good) in recent years. EPA comments on the most recent monitoring results for the River Liffey are as follows "*Ecological conditions were found to be satisfactory at the majority (14) of the 16 stations surveyed on the River Liffey in 2019. Satisfactory ecological conditions were maintained in the upper reaches (0100, 0200, 0250). Stations 0400 and 0500 (Ballymore Estuce) improved for the first time since 1991 and 2010, respectively. At both stations 0700 (Kilcullen) and 0850 (Connell Ford) High ecological condition were noted, despite obvious signs of nutrient enrichment (and excess filamentous algae), an improvement since 2016. Similarly, station 1200 (Castlekeely Ford (RHS)) improved from Moderate to Good. However, a note of caution is advised regarding this recovery as there were still signs of nutrient pressure with significant amounts of filamentous algae. In contrast, the macroinvertebrate community indicated a decline at both station 2100 (Lucan) which dropped to Moderate and station 2360 (0.2 km d/s Chapelizon Br (Lynch's Lane)) which dropped to Poor ecological conditions. Sewage fungus and Chironomus sp were found at this site. Station 0400 (Ballymore Eustace Br) was reassessed in July 2020 and remained at Good ecological condition, although signs of enrichment were very evident.*" EPA comments on the most recent monitoring results for Cloncumber Stream are as follows "*The macroinvertebrate* *fauna continue to indicate unsatisfactory moderate ecological conditions on the Cloncumber Stream at Old River Bridge (0200) in August 2020.*" In 2015 the Cloncumber Stream had a Q value (Q3*) which indicates something worthy of special attention, typically heavy siltation of the substratum.

**Table 5.4: Monitoring Stations on the River Liffey and Cloncumber near development site**

| STATION NO. | STATION LOCATION | EASTING | NORTHING | APPROX. LOCATION FROM SITE |
|---|---|---|---|---|
| RS14C170200 | Old River Br (W) | 274420 | 220919 | 8km NW |
| RS09L010850 | Connell Ford | 281396 | 213613 | 4.6km NE |
| RS09L011000 | 2.5 km d/s Newbridge | 281860 | 217762 | 5.87km N |

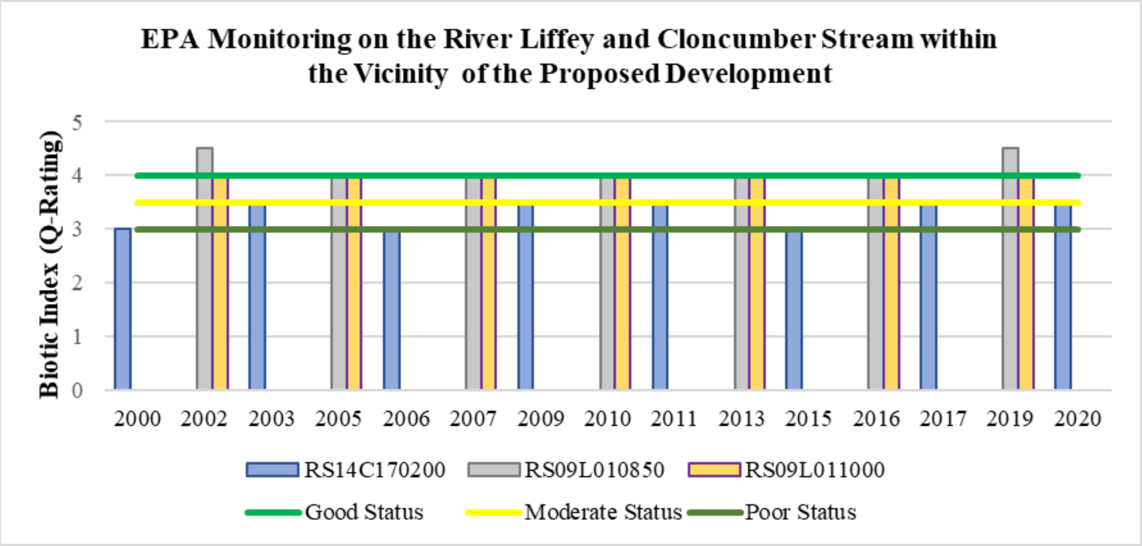


**Figure 5.15: EPA Ecological Monitoring of the River Liffey and Cloncumber Stream**

### 5.4.5 *Invasive Species*

Under Regulation 49(2) of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), save in accordance with a licence granted under paragraph (7), any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in any place specified in relation to any plant which is included in Part 1 of the Third Schedule shall be guilty of an offence.

Materials containing invasive species such as Japanese Knotweed are considered "controlled waste", and, as such, there are legal restrictions on their handling and disposal. Under Regulation 49(7) of the European Communities (Birds and Natural Habitats) Regulations 2011, it is a legal requirement to obtain a license to move "vector materials" listed in the Third Schedule, Part 3.

During the site assessment no invasive plant species listed in the Third Schedule of the European Communities Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) were recorded. Other invasive species recorded within the site;

**Table 5.5: Invasive Flora at Site**

| Invasive Species | Habitat |
|---|---|
| Sycamore (*Acer pseudoplatanus*) | WL2/WL1 |
| Cherry Laurel (*Prunus laurocerasus*) | WL2 |
| Butterfly-bush (*Buddleja davidii*) | ED1 |

Three invasive plant species listed in the Third Schedule of the European Communities Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) were recorded within the 10km square;

**Table 5.6: NBDC Invasive Flora Records**

| Third Schedule Invasive Species | Tetrad |
|---|---|
| Fringed Water-lily (*Nymphoides peltata*) | N71 |
| Giant Hogweed (*Heracleum mantegazzianum*) | N71 |
| Japanese Knotweed (*Fallopia japonica*) | N71 |

## 5.4 Protected Species

Developments have the potential to impact upon terrestrial and aquatic biodiversity through destruction and loss of habitat, disturbance due to noise and dust, the potential introduction of invasive species and light pollution.

### *5.4.1 Birds*

Given the agricultural and urban land use of the surrounding area it would be expected that common grassland, garden and hedgerow bird species would be present in the area. Bird species noted during the site assessment are included in the Table 5.7 below.

**Table 5.7: Birds Observed at Site**

| COMMON NAME | SCIENTIFIC NAME | E.U. BIRDS DIRECTIVE | BOCCI* RED LIST | BOCCI* AMBER LIST |
|---|---|---|---|---|
| Blackbird | *Turdus merula* | - | - | - |
| Blue Tit | *Parus caeruleus* | - | - | - |
| Bullfinch | *Pyrrhula pyrrhula* | - | - | - |
| Chaffinch | *Fringilla coelebs* | - | - | - |
| Dunnock | *Prunella modularis* | - | - | - |
| Great Tit | *Parus major* | - | - | - |
| Great Black-backed Gull | *Larus marinus* | - | - | - |
| Greenfinch | *Carduelis chloris* | - | - | ✓ |
| Goldfinch | *Carduelis carduelis* | - | - | - |
| Hooded Crow | Corvus cornix | - | - | - |
| House Martin | *Delichon urbicum* | - | - | ✓ |
| House Sparrow | *Passer domesticus* | - | - | ✓ |
| Jackdaw | *Corvus monedula* | - | - | - |
| Magpie | *Pica pica* | - | - | - |
| Pied Wagtail | *Motacilla alba* | - | - | - |
| Robin | *Erithacus rubecula* | - | - | ✓ |
| Rook | *Corvus frugilegus* | - | - | - |

| COMMON NAME | SCIENTIFIC NAME | E.U. BIRDS DIRECTIVE | BOCCI* RED LIST | BOCCI* AMBER LIST |
|---|---|---|---|---|
| Skylark | *Alauda arvensi* | - | - | ✓ |
| Starling | *Sturnus vulagaris* | - | - | ✓ |
| Swallow | *Hirundo rustica* | - | - | ✓ |
| Woodpigeon | *Columba palumbus* | - | - | - |
| Wren | *Troglodytes troglodytes* | - | - | - |

**The BoCCI (Birds of Conservation Concern in Ireland) List classifies bird species into one of three lists (Red, Amber or Green) based on their conservation status and conservation priority.*

Blackbird, Blue tit, Coal tit, Dunnock, Robin and Woodpigeon were observed within the hedgerows and treelines of the site. Chaffinch, Goldfinch, House Martin, House Sparrow, Skylark, Swallow and Wren were observed feeding within and/or over the fallow field made up of predominately Ragwort and Thistle. Jackdaw, Magpie and Rook were observed mainly within and around the gravel heaps. While Great Black-backed Gull was observed flying over the site. Additional species observed in January 2022 were Starling, Pied Wagtail, Bullfinch and Hooded Crow

No species are red listed under the BoCCI classification and six species Greenfinch, House Martin, House Sparrow, Starling and Skylark are amber listed. None of the bird species recorded are listed under Annex I of the E.U. Birds Directive. Bird records for the previous thirty years were reviewed on the NBDC website for the 10km square in which the proposed development is located. Bird species of note recorded within the N71 tetrad include;

**Table 5.8: NBDC Bird Records**

| NBDC Records for tetrad N71 | | |
|---|---|---|
| **Species** | **Dataset** | **Designation** |
| Barn Owl (*Tyto alba*) | Birds of Ireland | Red List |
| Barn Swallow (*Hirundo rustica*) | Birds of Ireland | Amber List |
| Black-headed Gull (*Larus ridibundus*) | Birds of Ireland | Red List |
| Common Coot (*Fulica atra*) | Birds of Ireland | Amber List |
| Common Grasshopper Warbler (*Locustella naevia*) | Birds of Ireland | Amber List |
| Common Kestrel (*Falco tinnunculus*) | Birds of Ireland | Amber List |
| Common Kingfisher (*Alcedo atthis*) | Birds of Ireland | Amber List |
| Common Linnet (*Carduelis cannabina*) | Birds of Ireland | Amber List |
| Common Redshank (*Tringa totanus*) | Irish Wetland Birds Survey (I-WeBS) 1994-2001. | Red List |
| Common Snipe (*Gallinago gallinago*) | Birds of Ireland | Amber List |
| Common Starling (*Sturnus vulgaris*) | Birds of Ireland | Amber List |
| Common Swift (*Apus apus*) | Birds of Ireland | Amber List |
| Eurasian Curlew (*Numenius arquata*) | Birds of Ireland | Red List |
| Eurasian Marsh Harrier (*Circus aeruginosus*) | Birds of Ireland | Protected Species: Wildlife Acts |

| | | |
|---|---|---|
| Eurasian Teal (*Anas crecca*) | Bird Atlas 2007 - 2011 | Amber List |
| Eurasian Tree Sparrow (*Passer montanus*) | Birds of Ireland | Amber List |
| Eurasian Wigeon (*Anas penelope*) | Birds of Ireland | Amber List |
| Eurasian Woodcock (*Scolopax rusticola*) | Birds of Ireland | Amber List |
| European Golden Plover (*Pluvialis apricaria*) | Birds of Ireland | Red List |
| Gadwall (*Anas strepera*) | Bird Atlas 2007 - 2011 | Amber List |
| Great Cormorant (*Phalacrocorax carbo*) | Irish Wetland Birds Survey (I-WeBS) 1994-2001. | Amber List |
| Grey Plover (*Pluvialis squatarola*) | Birds of Ireland | Amber List |
| Hen Harrier (*Circus cyaneus*) | Bird Atlas 2007 - 2011 | Amber List |
| House Martin (*Delichon urbicum*) | Birds of Ireland | Amber List |
| House Sparrow (*Passer domesticus*) | Birds of Ireland | Amber List |
| Lesser Black-backed Gull (*Larus fuscus*) | Irish Wetland Birds Survey (I-WeBS) 1994-2001. | Amber List |
| Little Egret (*Egretta garzetta*) | Bird Atlas 2007 - 2011 | Annex I Bird Species |
| Little Grebe (*Tachybaptus ruficollis*) | Bird Atlas 2007 - 2011 | Amber List |
| Merlin (*Falco columbarius*) | Birds of Ireland | Amber List |
| Mew Gull (*Larus canus*) | Birds of Ireland | Amber List |
| Mute Swan (*Cygnus olor*) | Birds of Ireland | Amber List |
| Northern Lapwing (*Vanellus vanellus*) | Birds of Ireland | Red List |
| Northern Shoveler (*Anas clypeata*) | Bird Atlas 2007 - 2011 | Red List |
| Peregrine Falcon (*Falco peregrinus*) | Bird Atlas 2007 - 2011 | Annex I Bird Species |
| Sand Martin (*Riparia riparia*) | Bird Atlas 2007 - 2011 | Amber List |
| Sky Lark (*Alauda arvensis*) | Birds of Ireland | Amber List |
| Spotted Flycatcher (*Muscicapa striata*) | Birds of Ireland | Amber List |
| Stock Pigeon (*Columba oenas*) | Bird Atlas 2007 - 2011 | Amber List |
| Tufted Duck (*Aythya fuligula*) | Irish Wetland Birds Survey (I-WeBS) 1994-2001. | Amber List |
| Water Rail (*Rallus aquaticus*) | Birds of Ireland | Amber List |
| Yellowhammer (*Emberiza citrinella*) | Birds of Ireland | Red List |

### 5.4.2 Badger

Badgers and their setts are protected under the provisions of the Wildlife Act, 1976, and the Wildlife Amendment Act, 2000. It is an offence to intentionally kill or injure a protected species or to wilfully interfere with or destroy the breeding site or resting place of a protected wild animal. The removal of badgers from affected setts and subsequent destruction of these setts must be conducted under licence by experienced badger experts or other suitably qualified personnel.During the site assessment, evidence of Badger was found. Typically, the main setts of a badger, which are the focus of the social groups, are usually larger than other setts, averaging seven entrances each (Smal, 1995). A badger sett is divided into different types with main setts used for breeding and have multiple entrances. With outliers usually have one entrance and lie towards the fringes of their territory (Lowen, 2016).

A badger sett was found along the west boundary in the mature hedgerow/treeline. The treeline is well established and has numerous specimens of mature Oak (*Quercus* spp.), with areas of thick Bramble (*Rubus fruticosus*) and Ivy (*Hedera helix*) undergrowth.

NBDC records within the vicinity show nine records of roadkill between 2012 - 2017 along the M7 motorway. There were no records on the NBDC database indicating badger within the surrounding landscape of the proposed development. This however likely reflects a lack of records rather than an absence of the species. There were no badger setts identified within the proposed main areas of building works during ecological surveys. Mitigation measures are proposed to avoid direct injury or disturbance to badger during site works.

**Figure 5.16: Badger set within the hedge boundary**

### *5.4.3 Bats*

All bat species are listed in Annex IV of the Habitats Directive while the Lesser Horseshoe (*Rhinolophus hipposideros*) is afforded additional protection through its inclusion on Annex II of the EU Habitats Directive. As a result, SACs have been designated for this species throughout its European range, including in Ireland.

It is an offence under Section 23 of the Wildlife Act and under Section 51 of Habitat Regulations, 2011 to kill a bat or to damage or destroy the breeding or resting place of any bat species. Under the Habitat Regulations, 2011 actions that intentionally or unintentionally harm, damage or destroy a bat or its roosting site are considered to be an offence. According to Section 54(2) of the Habitats

Regulations 2011, a derogation licence to disturb bats or the breeding or resting places may be granted ‘where there is no satisfactory alternative, and the derogation is not detrimental to the maintenance of the populations of the species to which the Habitats Directive relates at a favourable conservation status in their natural range. The assessment comprised of an external inspection of trees to identify potential roost features (PRFs) and evidence of bat activity. The criteria used to categorise the PRFs or suitability of trees as a potential roost are summarised in the table below, based upon the guidelines by Collins (2016) and Hundt (2012).

See accompanying Bat Survey Report by Meehan Ecology for a full assessment of the species found and methodology. Two bat surveys of the site were carried out on the 16th and 17th August 2020. The survey on the 16th was a dusk survey and commenced at 20.18 (30 minutes before sunset) and was two and a half hours in duration, finishing at 22.48. The survey on the 17th August was a dawn survey and commenced at 04.15 (two hours before sunrise) and was two and half hours in duration, finishing at 06.45. A handheld +EM3 bat detector and an etrex GPS device were used. The following bat surveys were detected on site: Leisler’s Bat (*Nyctalus leisleri*), Soprano Pipistrelle (*Pipistrellus pygmaeus*) and Common Pipistrelle (*Pipistrellus pipistrellus*). Activity levels were notably higher during the dusk survey and the majority of detections during both surveys were detected along the mature treeline.

All the mature Oaks within the western boundary between the development site and Ballymany Stud have moderate potential for bat roosts. These trees are mature with significant ivy growth and a well-established crown with potential openings and features suitable for roosting bats. Other tree species within this hedgerow such as Beech, Cypress and Scots Pine would be low for potential bat roosts.

The hedgerow along the Standhouse road would be negligible for potential bat roosting. The trees species found here are Ash. These trees are part of a hedgerow and the crown of these Ash trees are quite young as the trees would have been cut to maintain the hedgerow. There is one mature Ash tree within this hedgerow with low potential for bat roosting. The tree is surfing considerable dieback within the crown but has significant ivy growth around its trunk.

Figure 5.17: Examples of mature Oak trees with a moderate potential for bat roosts

Figure 5.18: Dying Ash & young Beech trees with low to negligible potential for bat roosting

The treeline to the east of the development along the boundary of the Keadeen Hotel is made up predominantly Beech with some Sycamore and Willow. These trees are not fully mature and would be negligible for bat roosting as they don't offer suitable roosting habitats. Elm is present along easy boundary with the residential properties however this tree is negligible as it's not mature and succumbing to Dutch Elm disease.

### 5.4.4 *Invertebrates*

The field to the north of the site contained an abundance of flowering Ragwort *(Senecio jacobaea)* and Spear Thistle (*Cirsium vulgare*). This attracted a significant number of Honeybees (*Apis*) and Bumblebees (*Bombus*). With butterfly species found throughout the site such as Peacock (*Inachis io*), Painted Lady (*Cynthia cardui*), Small Tortoiseshell (*Aglais urticae*), Small Copper (*Lycaena phlaeas*), Meadow Brown (*Maniola jurtina*) and Large White (*Pieris brassicae*). The hedgerows, treelines and grasslands would provide suitable habitat for invertebrates. With a lack of suitable aquatic habitats within the proposed development site there would not be any protected invertebrates associated with Pollardstown Fen.Invertebrates' records for the previous thirty years were reviewed on the NBDC website for the 10km square in which the proposed development is located. Invertebrates' species of note recorded within the N71 tetrad include;

**Table 5.9: NBDC Invertebrates Records**

| Species | Species name | Dataset | Designation |
|---|---|---|---|
| Beetle | *Hydroporus scalesianus* | Water Beetles of Ireland | Near threatened |
| Butterfly | Dingy Skipper (*Erynnis tages*) | Butterflies of Ireland | Near threatened |
| Butterfly | Large Heath (*Coenonympha tullia*) | Butterflies of Ireland | Vulnerable |
| Butterfly | Marsh Fritillary (*Euphydryas aurinia*) | Butterflies of Ireland | Vulnerable |
| Butterfly | Small Heath (*Coenonympha pamphilus*) | Butterflies of Ireland | Near threatened |
| Butterfly | Wall (*Lasiommata megera*) | Moths Ireland | Endangered |
| Bee | Large Red-Tailed Bumble Bee (*Bombus (Melanobombus) lapidarius*) | Bees of Ireland | Near threatened |
| Bee | Moss Carder-bee (*Bombus (Thoracombus) muscorum*) | Bees of Ireland | Near threatened |
| Mollusc | Budapest Slug (*Tandonia budapestensis*) | All Ireland Non-Marine Molluscan Database | Invasive Species |
| Mollusc | Common Whorl Snail (*Vertigo (Vertigo) pygmaea*) | All Ireland Non-Marine Molluscan Database | Near threatened |
| Mollusc | Desmoulin's Whorl Snail (*Vertigo (Vertigo) moulinsiana*) | All Ireland Non-Marine Molluscan Database | Endangered |
| Mollusc | English Chrysalis Snail (*Leiostyla (Leiostyla) anglica*) | All Ireland Non-Marine Molluscan Database | Vulnerable |
| Mollusc | Geyer's Whorl Snail (*Vertigo (Vertigo) geyeri*) | All Ireland Non-Marine Molluscan Database | Vulnerable |
| Mollusc | Hollowed Glass Snail (*Zonitoides (Zonitoides) excavatus*) | All Ireland Non-Marine Molluscan Database | Vulnerable |

| | | | |
|---|---|---|---|
| Mollusc | Jenkins' Spire Snail (*Potamopyrgus antipodarum*) | All Ireland Non-Marine Molluscan Database | Invasive Species |
| Mollusc | Keeled Slug (*Tandonia sowerbyi*) | All Ireland Non-Marine Molluscan Database | Invasive Species |
| Mollusc | Lake Orb Mussel (*Musculium lacustre*) | All Ireland Non-Marine Molluscan Database | Vulnerable |
| Mollusc | Marsh Whorl Snail (*Vertigo (Vertigo) antivertigo*) | All Ireland Non-Marine Molluscan Database | Vulnerable |
| Mollusc | Narrow-mouthed Whorl Snail (*Vertigo (Vertilla) angustior*) | All Ireland Non-Marine Molluscan Database | Vulnerable |
| Mollusc | Point Snail (*Acicula fusca*) | All Ireland Non-Marine Molluscan Database | Vulnerable |
| Mollusc | Prickly Snail (*Acanthinula aculeata*) | All Ireland Non-Marine Molluscan Database | Near threatened |
| Mollusc | Smooth Grass Snail (*Vallonia pulchella*) | All Ireland Non-Marine Molluscan Database | Vulnerable |
| Mollusc | Striated Whorl Snail (*Vertigo (Vertigo) substriata*) | All Ireland Non-Marine Molluscan Database | Near threatened |
| Mollusc | Wrinkled Snail (*Candidula intersecta*) | All Ireland Non-Marine Molluscan Database | Invasive Species |

### 5.4.5 Amphibians and Reptiles

The majority of the site consisting of sand and gravel would not offer suitable habitat for frogs or newts. The small pond located within the development would not be considered suitable habitat as was quite shallow and devoid of invertebrates. No Lizards were noted during the site assessment and the gravel heaps were quite exposed in places. The mature hedgerows could act as suitable terrestrial habitat and migration corridors for both amphibians and reptiles. NBDC website for the tetrad N71 include the protected species Common Frog (*Rana temporaria*), Smooth Newt (*Lissotriton vulgaris*) and Common Lizard (*Zootoca vivipara*).

### 5.4.6 Other Species

See accompanying Natura Impact Statement (Document Ref: PES_NIS_20_9794R1) for a complete assessment of Otter (*Lutra lutra*). The Otter is a qualifying interest of the River Barrow and River Nore SAC.

Evidence of Rabbit (*Oryctalagus cuniculus*) was found within the site, however the borrows were old and not in use. Rabbit faeces and a disused Fox (*Vulpes vulpes*) den were found within the site on the 14th of January 2022.

Other fauna not observed but would be typically found throughout the rest of Ireland would be present in the area of the proposed development. These include the protected Pine Marten (*Martes martes*), Irish Hare (*Lepus timidus hibernicus*), Pygmy Shrew (*Sorex minutus*) Hedgehog (*Erinus europaeus*) and Red Squirrel (*Sciurus vulgaris*). Also present would be Stoat (*Mustela erminea hibernica*) and Wood Mouse (*Apodemus sylvaticus*).

Fauna records for the previous thirty years were reviewed on the NBDC website for the tetrad N71 include the following the species Red Squirrel (*Sciurus vulgaris*), Pygmy Shrew (*Sorex minutus*), Pine Marten (*Martes martes*), Red Deer (*Cervus elaphus*) and Hedgehog (*Erinaceus europaeus*).

Invasive species within the tetrad N71 are American Mink (*Mustela vison*), Brown Rat *(Rattus norvegicus*), Grey Squirrel (*Sciurus carolinensis*), Rabbit (*Oryctolagus cuniculus*) and Sika Deer (*Cervus nippon*).

**Table 5.10: Ecological Value of Species of the Proposed Development**

| SPECIES | SPECIES RATING | RATIONALE |
|---|---|---|
| Badger | Local importance, higher value | Yes. The development site itself is a small foraging resource for badgers but in the context of the surrounding woodland and grassland is negligible. The treeline and hedgerow would provide both shelter and page foraging resource and are of high local importance for badger. |
| Bats (foraging and commuting habitat only – no bat roosts identified) | Local importance, higher value | Yes. The hedgerows / treelines within and adjacent to the proposed development are likely to be utilised by bats for both foraging and commuting. |
| Other | Local importance, low to high value | No. Limited Fauna sightings / evidence of other mammals. Site has limited potential to support other mammal species. |
| Breeding Birds | Local importance, higher value | Yes. All birds, their nests, eggs and young are protected under the Wildlife Act. |
| Aquatic Fauna | Local importance, lower value | No. The site contains no suitable nesting or foraging habitats. |

### 5.4.7 *National Parks and Wildlife Services Records*

Records of protected, rare or threatened flora and fauna species within 10km of the proposed development obtained from the NPWS are included in Tables 4.11 and 4.12 below.

**Table 5.11: Records of Protected, Rare or Threatened Flora Species from the NPWS**

| COMMON NAME | SCIENTIFIC NAME | PROTECTION[1] | CONSERVATION STATUS[2,3] |
|---|---|---|---|
| Basil Thyme | *Acinos arvensis* | FPO | Vulnerable |
| Bugloss | *Anchusa arvensis* | None | Near Threatened |
| Clustered Earth-moss | *Ephemerum cohaerens* | None | Vulnerable |
| Fly Orchid | *Scrophularia umbrosa* | None | Near Threatened |
| Green-Winged Orchid | *Ophrys insectifera* | None | Near Threatened |
| Henbane | *Hyoscyamus niger* | None | Near Threatened* |
| Meadow Saxifrage | *Saxifraga granulate* | FPO | Regionally Extinct* |
| Mountain Pansy | *Viola lutea* | None | Vulnerable * |
| Narrow-fruited Cornsalad | *Valerianella dentata* | None | Vulnerable |
| Opposite-leaved Pondweed | *Groenlandia densa* | None | Near Threatened |
| Red Hemp-nettle | *Galeopsis angustifolia* | FPO | Vulnerable |
| Reindeer Moss | *Cladonia portentosa* | HD V | Inadequate |
| Shepherd's-needle | *Scandix pecten-veneris* | None | Regionally Extinct |
| Upright Brome | *Bromopsis erecta* | None | Near Threatened |
| Yellow Bird's-nest | *Monotropa hypopitys* | None | Waiting List* |

Notes:
[1] HD II/IV = Habitats Directive Annexes II/IV; FPO = Flora Protection Order.
[2] Vascular flora from the Irish Red Data Book 1 Vascular Plants (Curtis and McGough, 1988; Wyse Jackson *et al.*, 2016); Bryophytes from the Irish Red List No. 8 (Lockhart *et al.*, 2012).
[3] IUCN Red list http://www.iucnredlist.org/ - accessed January 2022
* Record over 100 years old.

**Table 5.12: Records of Protected, Rare or Threatened Fauna Species from the NPWS**

| COMMON NAME | SCIENTIFIC NAME | PROTECTION[1] | CONSERVATION STATUS[2,3] |
|---|---|---|---|
| Badger | *Meles meles* | WA | Least Concern |
| Brook Lamprey | *Lampetra planeri* | HD II | Least Concern |
| Common Frog | *Rana temporaria* | WA | Least Concern |
| Desmoulin's whorl snail | *Vertigo moulinsiana* | HD II/V, WA | Endangered |
| Geyer's Whorl Snail | *Vertigo geyeri* | HD II/V, WA | Vulnerable |
| Hedgehog | *Erinaceus europaeus* | WA | Least Concern |
| Irish Hare | *Lepus timidus hibernicus* | WA | Least Concern |
| Irish Stoat | *Mustela erminea hibernica* | WA | Least Concern |

| COMMON NAME | SCIENTIFIC NAME | PROTECTION[1] | CONSERVATION STATUS[2,3] |
|---|---|---|---|
| Marsh Fritillary | *Eurodryas aurinia* | HD II | Vulnerable |
| Narrow-mouthed Whorl Snail | *Vertigo angustior* | HD II/V, WA | Vulnerable |
| Otter | *Lutra lutra* | HD II/IV, WA | Near Threatened |
| Pine Marten | *Martes martes* | WA | Least Concern |
| Red Squirrel | *Sciurus vulgaris* | WA | Near Threatened |
| Sika Deer | *Cervus nippon* | WA | Least Concern |
| White-clawed Crayfish | *Austropotamobius pallipes* | HD II/V WA | Endangered |

Notes:

[1] HD II/IV/V = Habitats Directive Annex II/IV/V; WA= Wildlife Acts; BDI = Birds Directive Annex I

[2] Terrestrial Mammal Red List (Marnell *et al.* 2009); Birds of Conservation Concern in Ireland 2020-2026 (G. Gilbert, A. Stanbury & L. Lewis, 2021); Red-listed Amphibians, Reptiles and Freshwater Fish (King *et al.* 2011); Red-listed Non-marine Molluscs (Byrne *et al.*, 2009).

[3] IUCN Red list http://www.iucnredlist.org/ - accessed January 2022

## 5.5. Protected Sites

### *5.5.1 Natura 2000 Sites Within Zone of Influence*

In assessing the zone of influence of this project upon European sites, the following factors must be considered:

- Potential impacts arising from the project;
- The location and nature of European sites;
- Pathways between the development and European sites.

There is no standard radius that can be used to select which European sites are to be analysed. This can only be determined by looking at the zone of influence of the project at hand. A rule of thumb often used is to include all European sites within a distance of 15km.

No Special Protection Area (SPA) sites occur within 15km of the proposed development. Five Special Area of Conservation (SAC) sites occur within 15km of the proposed development and are shown in the following table:

**Table 5.13: Natura 2000 Sites**

| SITE NAME | DESIGNATION | SITE CODE | DISTANCE |
|---|---|---|---|
| Pollardstown Fen | SAC | 000396 | 620m NW |
| Mouds Bog | SAC | 002331 | 3.6km N |
| River Barrow and River Nore | SAC | 002162 | 11km SW |
| Ballynafagh Lake | SAC | 001387 | 11.3km NE |
| Ballynafagh Bog | SAC | 000391 | 13km NE |

See accompanying Natura Impact Statement (Document Ref: PES_NIS_20_9794R1) for a complete assessment of the SACs and their qualifying interests.

### 5.5.2 *Natural Heritage Areas within Zone of Influence*

No National Heritage Areas occur within 15km of the proposed development. Nine proposed National Heritage Areas (pNHA) occur within 15km of the proposed development.

**Table 5.14: Natural Heritage Areas**

| SITE NAME | DESIGNATION | SITE CODE | DISTANCE |
|---|---|---|---|
| Pollardstown Fen | pNHA | 000396 | 620m NW |
| Curragh | pNHA | 000392 | 810m SW |
| Grand Canal | pNHA | 002104 | 4.1km NW |
| Liffey Bank Above Athgarvan | pNHA | 001396 | 4.3km SE |
| Dunlavin Marshes | pNHA | 001772 | 12.1km SE |
| Liffey Valley Meander Belt | pNHA | 000393 | 12.6km SE |
| Ballynafagh Bog | pNHA | 000391 | 13.3km N |
| Ballynafagh Lake | pNHA | 001387 | 14.5km N |
| Newtown Marshes | pNHA | 001759 | 14.9km SE |

See Appendix A for maps of the pNHAs within 2km and 15km of the proposed development site.

Pollardstown Fen pNHA is very similar in size to Pollardstown Fen SAC. Potential impacts and proposed mitigation measures for Pollardstown Fen SAC have been outlined in the NIS report. Potential impacts on air quality/dust and proposed mitigation measures have been outlined within the NIS report in relation to bog/peat habitats.

Water quality would have an impact on the Grand Canal pNHA and mitigation measures have been proposed for the potential impact this development will have on water quality during both the construction and operational phase.

The Liffey Bank Above Athgarvan pNHA and Liffey Valley Meander Belt pNHA are both located upstream of the proposed development on the River Liffey. This limits the potential connectivity to these sites and would therefore the proposed development would not have a significant impact on the habitats and species located here.

The Curragh pNHA is a significantly important Dry-humid acid grassland (GS3) habitat in Ireland. The Curragh is predominately made up of Sheep fescue (*Festuca ovina*) with the bryophyte *Rhytidiadelphus squarrosus* abundant in the ground layer. The Curragh aquifer is a main source of water for Pollardstown Fen and is important habitat for wintering Lapwing (*Vanellus vanellus*) and Golden Plover (*Pluvialis apricari*a). The Curragh is mainly in use for Sheep grazing and Horse racing. Potential impacts on this pNHA are increased off road driving and illegal dumping. The Irish Semi-natural Grasslands Survey 2007-2012 noted the Curragh was one of the largest areas of grassland habitat affected by the habitat review that resulted in the acidic grasslands of the Curragh being no longer regarded as the Annex I habitat, due to a lack of species diversity (O’Neil et al, 2013).

## 5.6 Ecological Impact Assessment

The construction phase of the development would result in a direct and permanent loss of the existing habitats scrub (WS1), earth banks (BL2) recolonising bare ground (ED3), dry meadows and grassy verges (GS2) and exposed sand, gravel or till (ED1). The majority of the flora found here are recolonising species, as such the area would be considered as having been modified and of low ecological value. Therefore, the loss of this habitat would not be considered significant.

The removal of the northern hedgerow along Standhouse Road is permitted and being carried out under Planning Ref. 16/658. Hedgerow / tree removal would not be undertaken during the 1st March to the 31st August, so as not to disturb nesting bird species. The treeline along the western boundary with Ballymany Stud is of moderate ecological significant and will not be removed. In particular, the mature Oak trees provide extensive ecological value and this hedgerow is in use by animals such as Badger and Bats.

Dust emissions may arise during construction activities, in particular during earth-moving works, which may have the potential to impact upon photosynthesis, respiration and transpiration processes of flora due to the blocking of leaf stomata and have the potential to cause nuisance to fauna. Given the transient nature of construction works the potential impact to flora and fauna would not be considered significant when appropriate measures are taken to protect the environment during the construction phase. See accompanying Natura Impact Statement (Document Ref: PES_NIS_20_9794R1) for mitigation measures to reduce the impact of dust on the surrounding environment.

### *5.6.1 Terrestrial Biodiversity Protection Protocol*

Potential Impacts

The proposed development could impact on the wider ecological environment during the construction phase due to potential disturbance and construction activities.

Mitigation/Monitoring Measures

As a matter of standard construction practice, the development would be constructed in accordance with the following methods and guidelines:

- All construction works would be confined as far as possible to the development footprint;
- Where possible, vegetation removal works would be scheduled outside of the 1st of March to the 31st of August period, so as not to disturb nesting bird species;
- If works should take place beside any trees that will remain as part of the landscape plan, then a buffer zone of 2m would be applied onsite where possible;
- A tree arborist report has been prepared in conjunction with this report and all recemented measures to protect trees should be taken and implemented;
- The construction works contractor would take cognisance of the NRA's document "*Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes*", 2006. In particular, the construction works contractor would take cognisance of the guidelines with regards soakaway, sewage system and percolation area and the determination of the root protection area of the existing trees to be retained along the boundary of the proposed dwelling;
- A Landscape Plan will be prepared as part of the development and will take into consideration the urban setting and the use of native species where possible;
- All planting of trees and hedges to be undertaken during bare root season November to April. The balance of tree planting and lawn seeding to be completed within 12 months of the completion of construction work of the development.

Residual Impacts

Assuming all mitigation measures are put in place, there would be no significant residual impacts to the terrestrial ecology from the proposed development.

### *5.6.2 Disturbance to Protected Habitats and Species*

The proposed development does not directly impinge on any part of a protected site, and as such would not be expected to have any in-situ effects upon a protected site through loss or destruction of habitat, fragmentation of habitat, disturbance of habitat or direct reduction in species density.

### *5.6.2.1 Badger*

The badger setts recorded during ecological survey are within the zone of influence of significant disturbance of the proposed development located along the western treeline boundary.

Potential Impacts

This sett could be negatively impacted due to disturbance during the construction phase. Badgers could enter into an active construction site.

Mitigation/Monitoring Measures

Mitigation measures should be put in place regard for Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes (NRA 2006).

The building site should be made safe for mammals with hazards such as open holes/excavations covered over or fitted with ramps to allow for escape. Guidelines on both active and inactive sets must be followed:

“The destruction of a successfully evacuated badger sett may only be conducted under the supervision of qualified and experienced personnel under licence from the NPWS. The possibility of badgers remaining within a sett must always be considered; suitable equipment should be available on hand to deal with badgers within the sett or any badgers injured during sett destruction”

A metal fence will be installed along the boundary of the mature treeline that will limit access to the site for large mammals such as Badger. This will also prevent any construction work from imposing on the treeline and disturbing any Badgers within this area.

Where possible, no construction works would be conducted outside of normal working hours, to reduce potential noise disturbance to nocturnal species.
Should a Badger be found during the construction phase of the project, an officer of the NPWS would be notified prior to the resumption of construction works.

Residual Impacts

The proposed development would limit foraging habitat for badgers however the majority of the site is exposed gravel which would not offer ideal foraging habitat for badgers. The site is on the edge of the town with residential developments to the northeast and southeast. Badgers in the area would forage in agricultural land/hedgerows to the west and north of the site. The sett was not active during the site assessment and this treeline is outside the site boundary and will not be accessible from the proposed development therefore any badgers active along the treeline will not be disturbed during the operation phase of the proposed development.

#### *5.6.2.2 Bats*

Potential Impacts

Artificial lighting during the construction and operational phases has the potential to negatively impact upon bat species, as illumination can impact upon their roosting sites, commuting routes and foraging areas. Cutting down or disturbing potential roosting sites for bats.

Mitigation/Monitoring Measures

Artificial Lighting during construction phase;

- Construction works in the hours of darkness, when bats are active (April – October), would be kept to a minimum;
- Lighting of hedgerows / treelines would be avoided where possible;
- Should lighting be required during construction works, it would be of a low height (without compromising safe working conditions) to ensure minimal light spill. Where possible and where practicable to do so, timers or motion sensors would be used;
- Directional lighting would be used where possible, by use of louvres or shields fitted to the lighting;
- White light emitting diode (LED) would be used where possible, which is considered to be low impact in comparison to other lighting types

Artificial Lighting during operational phase;

The lighting design for the proposed development would be finalised at the detailed design stage. The lighting design would take cognisance of the following mitigation measures:

- Lighting would be directed to where it is required only;
- Lighting of hedgerows / treelines would be avoided where possible;
- Buildings, carparks and site entrance lighting would be angled away from hedgerows and treelines;
- Lighting would be of low height where possible, to minimise light spill;
- Where possible and practicable to do so, timers or motion sensors would be used;
- White LED or amber coloured LED outdoor lighting would be used where possible, which is considered to be low impact in comparison to other lighting types.

Residual Impacts

Three species of bat were detected using the site with bat activity concentrated along the mature treeline. This treeline along the eastern boundary contains notable oak specimens and is an important area for the local bat population. The installation of sympathetic lighting in the vicinity of this treeline and other boundary hedgerows will enable these landscape features to continue to be used by bats, post construction.

#### *5.6.2.3 Other Fauna*

Potential Impacts

It is not anticipated that there would be any significant impacts upon other fauna during the operational/construction phase of the development. The proposed development does not contain any aquatic habitats of note nor would the vegetation within the site support other protected fauna. During the operational phase water quality could impact protected habitats that support fauna such as otter.

Mitigation/Monitoring Measures

Stormwater from the proposed development would comprise of clean rainwater run-off from roof and paved areas and would be directed to the drainage network and attenuation system within the proposed development.

Residual Impacts

Assuming all mitigation measures are put in place, there would be no significant residual impacts to any other protected fauna from the proposed development.

### *5.6.3 Invasive Species*

Potential Impacts

During construction works, there is potential for invasive species to be introduced to the site through the movement of materials, such as soil and stone, and the arrival of construction plant and equipment from an area with invasive species.

Mitigation/Monitoring Measures

The following controls for the prevention / treatment of invasive flora species would be implemented throughout the construction phase of the development:

- Regular site inspections would be undertaken to ensure that no growth of invasive species has taken place;
- The construction works contractor would ensure that all equipment and plant is inspected for the presence of invasive species and thoroughly washed prior to arriving to, and leaving from, the development site;
- All relevant construction personnel would be trained in invasive flora species (main species of concern) identification and control measures;
- In the unlikely event of an invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 appearing onsite, works within the immediate vicinity would cease until the invasive plant has been appropriately treated and disposed of to a

  suitably licenced facility, in accordance with Regulation 49 of the 2011 Regulations;
  - Cognisance would be taken of the National Roads Authority's Guidelines on "*The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads*".

Residual Impacts

The proposed development will include a landscape plan that will use native and non-invasive ornamental species. It is an offence to transport Third Schedule invasive species and in the unlikely event an invasive species is found at the site during the operational phase an Invasive Species Management Plan would be put in place.

### *5.6.4 Aquatic Ecology*

Potential Impacts

Construction works have the potential to impact upon flora and fauna due to a deterioration in water quality. Risks to water quality could arise due to the potential release of suspended solids during soil disturbance works, the release of uncured concrete and the release of hydrocarbons (fuels and oils).

Mitigation/Monitoring Measures

The following mitigation measures would be proposed to ensure there is no significant impact upon the aquatic ecology of the area owing to a deterioration in water quality:

- The construction works contractor would adhere to standard construction best practice, taking cognisance of the Construction Industry Research and Information Association (CIRIA) guidelines "Control of Water Pollution from Construction Sites; guidance for consultants and contractors" 2001 and "Control of Water Pollution from Construction Sites – Guide to Good Practice", 2002;
- Excavations and earth-moving activities would be planned outside periods of heavy rainfall, to limit the potential for suspended solids to become entrained within surface water run-off;
- Silt fencing would be placed around spoil areas until such time as the excavated soil has been used in landscaping / re-instatement works;
- Where possible, surface water run-off would be diverted from areas of bare / exposed ground;
- The use of pre-cast concrete where possible;
- The delivery and pouring of concrete would be supervised;
- All plant machinery and equipment would be maintained in good working order and regularly inspected;
- The re-fuelling of machinery would not take place within the immediate vicinity of watercourses, including drainage ditches;
- Spill kits, adequately stocked with spill clean-up materials such as booms and absorbent pads, would be available onsite;
  - In the unlikely event of a hydrocarbon spillage, contaminated spill clean-up material would be properly disposed of to an authorised waste contractor;

- Cognisance should be taken of Inland Fisheries Ireland's "*Guidelines on Protection of Fisheries During Construction Works in and adjacent to Waters*";

Residual Impacts

Assuming all mitigation measures are put in place, there would be no significant residual impacts to the aquatic environment from the proposed development.

## 5.7 Interactions

In line with requirements of EC Directive 85/337/EC (as amended) and the Planning and Development Regulations 2001, any interactions/inter-relationship between the various environmental factors was also taken into account as part of the EIAR scoping and assessment for biodiversity. Where a potential exists for interaction between two or more environmental topics, the relevant specialists have taken the potential interactions into account when making their assessment and where possible complementary mitigation measures have been proposed.

### *5.7.1 Noise, Human Beings & Biodiversity*

During the construction phase, noise may be generated due to increased vehicle movements and the operation of construction plant. It is anticipated that there would be a moderate impact, for a limited period of time, on any fauna within the vicinity of the development. Control and mitigation measures would be implemented to reduce noise, including measures relating to equipment operation and maintenance and timing of activities. Given the transient nature of construction works, and provided mitigation measures are implemented, noise from construction would not be considered to pose a significant impact upon fauna. During the operational phase noise would be typical of an urban residential development. There would be would no significant impact on fauna within the vicinity of the proposed development.

### *5.7.2 Air & Biodiversity*

An adverse impact on air quality has the potential to cause dust nuisance and cause disturbance to fauna. The risk to air quality as a result of the proposed development would not be considered significant, both at the local community level and on a broader national / global scale. Air emissions would be typical of residential buildings, being primarily from heating and therefore low impact in-and-of-itself. In-combination residential impacts would be controlled by national energy policies and grant schemes. While there would be increased noise emissions during the construction phase, these would not be considered to pose a significant risk owing to the transient nature of construction works and the construction timeframe.

During the construction phase of the development, there would be potential for dust emissions, which could impact upon flora and fauna in the surrounding area. The potential impact of dust would be temporary, given the transient nature of construction works. Dust control would be an integral part of construction management practices, with mitigation measures implemented where required, including sweeping of roads and hardstand areas, appropriate storage and transport of material and dust suppression measures where required.

### *5.7.3 Water Quality & Biodiversity*

A deterioration in water quality would impact upon aquatic flora and fauna, would negatively affect the fishery industry and in very severe cases, may impact upon any water-based leisure activities and amenities of the area. A deterioration in water quality could occur during construction works through the release of suspended solids during soil disturbance works, the release of uncured concrete and hydrocarbon spillages, and during the operational phase due to the discharge of treated effluent. Suspended solids potentially entrained in surface water run-off during construction works can impact upon aquatic habitats through deposition, reducing clarity and by potentially increasing nutrients which are bound to the suspended solids. An increase in sediments has the potential to impact upon fish by damaging gravel beds required for spawning, smothering fish eggs and in extreme cases, by interfering with the gills of fish. Consequently, an impact on fish would affect fauna, such as the otter (*Lutra lutra*), who prey on fish.

During construction works, there would be a potential risk to water quality from releases of uncured concrete and hydrocarbons from the operation of heavy construction plant and associated equipment. Uncured concrete has the potential to alter the pH of waters locally, while hydrocarbons can lead to potentially toxic and / or de-oxygenating conditions within waters. The proposed development would not be anticipated to have a significant impact on aquatic flora and fauna due to a deterioration in water quality of any nearby watercourses (See Figure 4.4.1) during either the construction or operational phase. During the construction phase, surface water quality would be protected through the implementation of mitigation measures, which include the use of appropriate silt control features, the regular maintenance and inspection of construction plant and the appropriate storage of potentially polluting substances. During the operational phase, no impact on water quality is anticipated as wastewater will flow to the existing main municipal sewer which has been upgraded with increased capacity. Surface/stormwater run-off will flow through a drainage system and attenuation system within the site to prevent any sediments or hydrocarbons from entering any watercourse or drainage ditch within the vicinity of the proposed development.

### *5.7.4 Material Assets & Biodiversity*

The proposed development would alter flora cover and the species of fauna supported due to land take and soil disturbance works. This impact would be minor due to the low ecological value of the habitats present at the proposed development.

## 5.8 Cumulative Impacts

The residual impact of this proposed development is anticipated to be slight negative local effect. Cumulative effects from a development in general can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location (CIEEM, 2018).

Considering the nature of the development and the adjacent urban town, the main potential cumulative impact upon biodiversity would be a deterioration in water quality during the operational phase resulting in an impact upon aquatic flora and fauna species and / or loss or fragmentation of natural habitat.

It is not anticipated that there would be any significant impact upon water quality during the operational phase, given that stormwater from the site would be directed to the drainage network and attenuation system. All foul and domestic wastewater will connect with to Osberstown WWTP which serves the town of Newbridge. Upgrade of Osberstown WWTP was started in 2016. Irish Water are currently in the process of upgrading the sewerage network within Newbridge as part of the Upper Liffey Valley Sewerage Scheme. This project aims to stop overflows and flooding during storms and to allow for additional capacity and for future growth in towns such as Newbridge.

A residential development granted permission on the opposite side of Ballymany Road (Ref. ABP-311040-21) was reviewed for potential cumulative impacts on ecology. The proposed development by Glan Developments Ltd. did not have a significant impact on ecology of the area. Mature trees are to be maintained as part of this development. As noted in the Bat Survey by Meehan Ecology Ltd, there are no potential bat roosts within the proposed development boundary. The mature treeline is outside the site boundary and will not be disturbed as part of this development. Both the proposed development and the Glan Developments Ltd site have included a Landscape Plan and Arborist report for the protection of trees. In addition, for ABP-311040-21 a maintenance policy to include regular operational inspection and maintenance of the SUDS infrastructure and the petrol/oil interceptors will be submitted to and agreed with the planning authority prior to the operational phase of the proposed development.

With regards potential habitat loss or fragmentation of habitat, the proposed development is not anticipated to result in a significant impact upon habitat loss / fragmentation during either the construction or operational phases, given that the majority of the land take would comprise of modified habitats of low ecological value, and given that the landscape plan for the development will take into consideration the setting and use of native species. The mature treeline along the western boundary will not be removed and consideration for the species found here should be included in the landscape plan. Therefore, there would be no cumulative habitat loss or fragmentation impacts which could pose a significant risk to biodiversity.

Potential cumulative lighting impacts from external lighting for both developments have been addressed in the mitigation measures proposed in Section 5.6 for this development therefore cumulative impacts as a result of external lighting should not arise.

### *5.8.1 “Do Nothing” Scenario*

The footprint of the proposed development is mainly comprised of habitats which are modified and of low ecological value. The majority of the site is exposed sand, gravel and till (ED1) habitat with limited flora found here. The north section of the site is composed of recolonising bare ground (ED3) habitat and the flora found here are typical of recolonising flora found on fallow land. Scrub habitat (WS1) habitat is likely to spread with Gorse remaining the dominant flora. It is likely if this development did not proceed the north section would return to agricultural use however the area of gravel would need to be removed in order for any agricultural use of the land. As the site is within a large urban town and contains no habitats or species of note it is likely that this site will be developed for residential or commercial use in the future.

## 5.9 Difficulties Encountered in Compiling

There were no difficulties encountered in compiling any specific information regarding biodiversity.

| IMPACT | DEVELOPMENT PHASE | SIGNIFICANCE | MITIGATION MEASURES | RESIDUAL SIGNIFICANCE | RESIDUAL IMPACT TYPE |
|---|---|---|---|---|---|
| Habitat Loss | Construction & Operational | Slight significance | • Excavated soils would be segregated into subsoil and topsoil and reused in reinstatement and landscaping works. Where possible, natural recolonization would be allowed to take place;<br>• The landscaping plan for the development take into consideration the setting and use of native species. | Minor | Neutral |
| Introduction of Invasive Flora Species | Construction | Slight significance | • Construction plant would be inspected and washed prior to arriving onsite;<br>• Regular site inspections for the presence of invasive species would be undertaken;<br>• Should invasive species appear onsite, works would immediately cease until the plant was appropriately treated and disposed of. | Minor | Neutral |
| Fauna Disturbance | Construction | Moderate significance | • Where possible, no construction works would be conducted outside of normal working hours<br>• All plant machinery and equipment would be maintained in good working order and regularly inspected<br>• Where possible, vehicles would be equipped with mufflers to suppress noise<br>• As a minimum, the construction work contractor would comply with all legislative provisions relating to hedgerow / tree removal<br>• Should a protected fauna species be found during the construction phase, the NPWS would be notified prior to the resumption of construction works<br>• Works should not take place beside a Badger Sett and guidelines by NRA followed. | Moderate | Minor |

| IMPACT | DEVELOPMENT PHASE | SIGNIFICANCE | MITIGATION MEASURES | RESIDUAL SIGNIFICANCE | RESIDUAL IMPACT TYPE |
|---|---|---|---|---|---|
| | | | • Fencing to limit access to the site. | | |
| | Operational | Not significant | None required | Imperceptible | Neutral |
| Fauna Mortality | Construction | Moderate significance | • As a minimum, the construction work contractor would comply with all legislative provisions relating to hedgerow / tree removal<br>• Where hedgerow / tree removal works are required during the bird nesting season (1st March to 31st August), the sections / trees for removal would be inspected by an ecologist for the presence of breeding birds. Where nests are present, a decision would be made as to whether a licence is required from the NPWS, or whether a suitable buffer zone could be established around the active nest with removal works rescheduled until chicks have fledged.<br>• Badger sett must not be disturbed until a suitably qualified inspection/study has been carried out. | Minor | Minor |
| Bats – Disturbance / Severance of Habitat | Construction | Moderate significance | • Landscape plan would take into consideration the mature treeline and would take steps to enhance this boundary with suitable planting if required;<br>• Measures would be implemented to reduce the potential for light pollution<br>• Construction works in the hours of darkness would be kept to a minimum | Minor | Neutral |
| | Operational | Moderate significance | • Lighting design measures would be implemented to reduce the potential for light pollution | Minor | Neutral |
| Surface Water Quality | Construction | Moderate significance | • Standard construction control measures for the protection of surface waters would be implemented | Moderate | Neutral |

| IMPACT | DEVELOPMENT PHASE | SIGNIFICANCE | MITIGATION MEASURES | RESIDUAL SIGNIFICANCE | RESIDUAL IMPACT TYPE |
|---|---|---|---|---|---|
| Deterioration | | | • Concrete works would be supervised<br>• Appropriate storage and handling of fuels and oils<br>• Provision of spill kits | | |
| | Operational | Not significant | • Ensure maintenance of drainage system | Minor | Neutral |
| Designated Sites | Construction | Moderate significance | • Standard construction control measures for the protection of surface waters would be implemented<br>• Concrete works would be supervised<br>• Appropriate storage and handling of fuels and oils<br>• Provision of spill kits | Minor | Neutral |
| | Operational | Not significant | None required | Imperceptible | Neutral |

## 5.9 Conclusions

It is the conclusion of this report that there would be no potential for any significant impact on protected species as a result of the proposed development. Mitigation measures put in place ensure the protection of flora and fauna will ensure there are no potential for significant effects, and the project is recommended to proceed as proposed.

## 5.10 References

Averis, B. (2013) *Plants and Habitats: An introduction to common plants and their habitats in Britain and Ireland*. United Kingdom: Swallowtail Print Ltd.

Balmer, E. (2007). *A Concise Guide to Butterflies & Moths.* Parrago

Bang, P., Dahlstrøm, P. and Walters, M. (2006) *Animal Tracks and Signs.* Oxford University Press

Bat Conservation Trust (2018). Bats and artificial lighting in the UK. Bats and the Built Environment series. Guidance Note 08/18.

Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn.) (Collins 2016).

Cabot, D. (2004) *Irish Birds*. Harper Collins Publishers, London

Chinery, M. (2009). *Collins Complete Guide to British Insects*. Collins

Collins. (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition).

*Council Directive (EC) 2009/147/EC of 30 November 2009 on the conservation of wild birds.*

*Council Directive (EC) 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.*

Curtis, T. and Thompson, R. (2009) *The Orchids of Ireland.* National Museums Northern Ireland

Devlin, Z. (2014) *Wildflowers of Ireland: A Field Guide*. Cork: Collins Press.

Feehan, J. Sheridan, H and McAdam, J. (2012) *The Grasses of Ireland.* Teagasc, Ireland

Fossitt, J.A. (2000) *A Guide to Habitats in Ireland*. Kilkenny: The Heritage Council.

Harrap, S. (2013) Wild Flowers, A Field Guide to the Flowers of Britain & Ireland. Bloomsbury Publishing

Hickie, D. (2002) *Native trees and forests of Ireland.* Gill & Macmillan Ltd. Dublin

Hundt, L. (2012). Bat Surveys: Good Practice Guidelines, 2nd edition.

Johnson, O. and More, D. (2006) *Collins Tree Guide: The Most Complete Field Guide to the Trees of Britain and Europe*. London: Harper Collins Publishers.

Kelleher, C. and Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. NPWS.

Kelly, M. and Reynolds, J. (2020) *Ireland's Rivers*. University College Dublin Press

Lowen, J. (2016) *RSPB Spotlight Badgers*. Bloomsbury Publishing, London.

National Parks and Wildlife Service, available at: http://www.npws.ie/protected-sites

O'Neill, F.H., Martin, J.R., Devaney, F.M. & Perrin, P.M. (2013) The Irish semi-natural grasslands survey 2007-2012. Irish Wildlife Manuals, No. 78. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.

Parnell, J. and Curtis, T. (2012) *Webb's An Irish Flora*. Cork: Cork University Press.

Philips, R. (1980) *Grasses, Ferns, Mosses & Lichens of Great Britain and Ireland*. London: Pan Books.

Rose, F. (2006) *The Wildflower Key: How to identify wild flowers, trees and shrubs in Britain and Ireland*. China: Frederick Warne & Co.

Russ, J. (2012). British Bat Calls: A Guide to Species Identification. Pelagic Publishing.

Smal, C. (1995) *The Badger and Habitat Survey of Ireland.* The Department of Agricultural, Food and Forestry. Published by the Stationery Office Dublin.

Smith, G.F., O'Donoghue, P., O'Hora, K. and Delaney, E. (2011) *Best Practice Guidance for habitat survey and mapping*. The Heritage Council, Kilkenny. Available at: www.heritagecouncil.ie/wildlife/publications/

Streeter, D. and Hart-Davies, C. (2010) *Collins Flower Guide*. Harper Collins Publishers Limited.

Sterry, P. (2004) *Complete Irish Wildlife*. Harper Collins Publishers, London

Sutherland, W.J. (Ed.). (2006) *Ecological Census Techniques*. United Kingdom: Cambridge University Press.

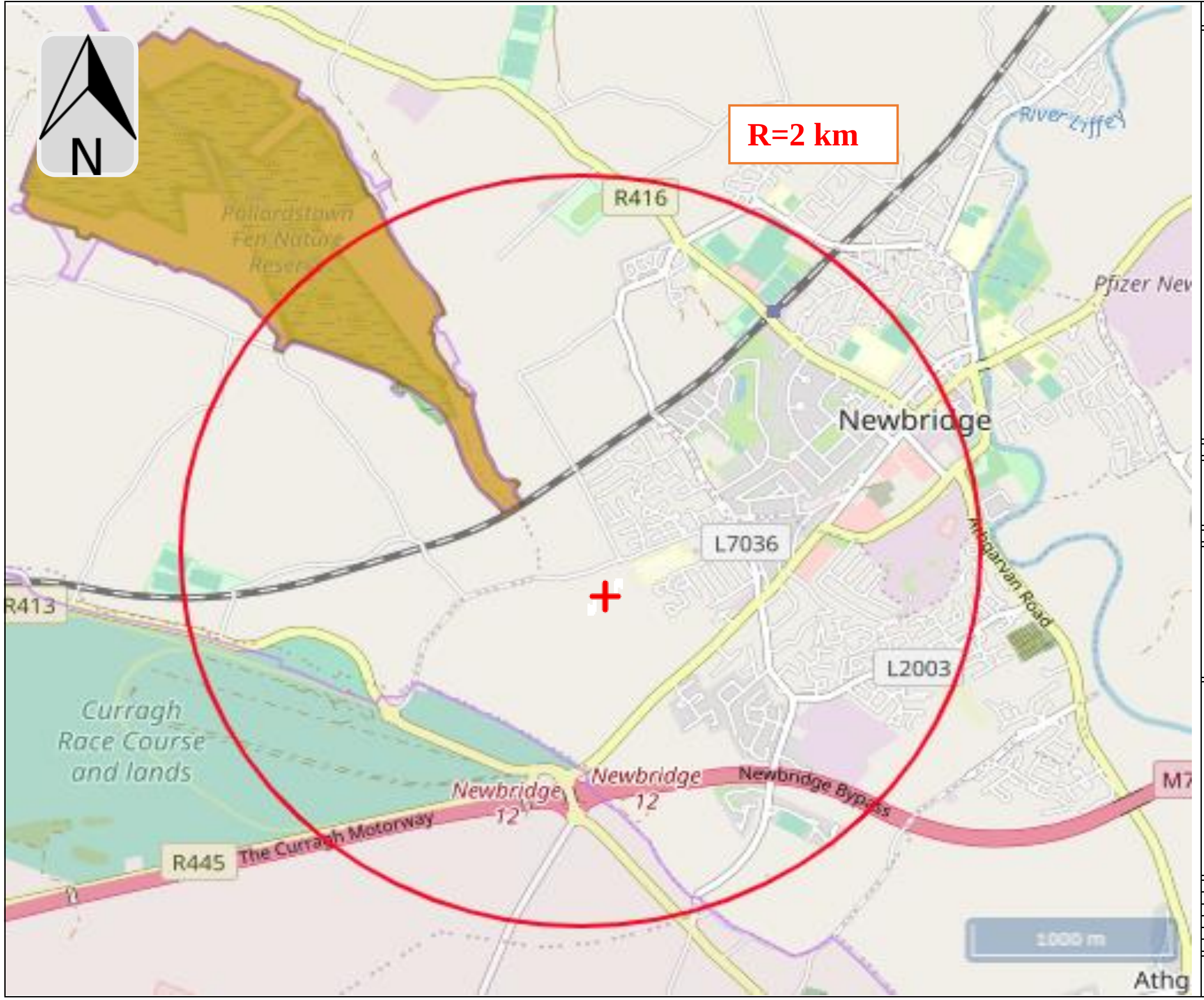
Waring, P., Townsend, M., Lewington, R. (2017) *Field Guide to the Moths of Great Britain and Ireland: Third Edition*. Bloomsbury Publishing

Wheater, C.P., Bell, J.R. and Cook, P.A. (2011) *Practical Field Ecology: A Project Guide*. John Wiley & Sons.

Wilson, J. and Carmody, M. (2013) *The Birds of Ireland*. Gill Books

# Appendix 5.1

## - PROTECTED SITES -



Notes

Site Location – +

S.P.A. – 🟩

S.A.C. – 🟫

pNHA - 🟨

Project Title:

PROTECTED SITES MAP

Client Name:

Briargate Developments Newbridge Limited

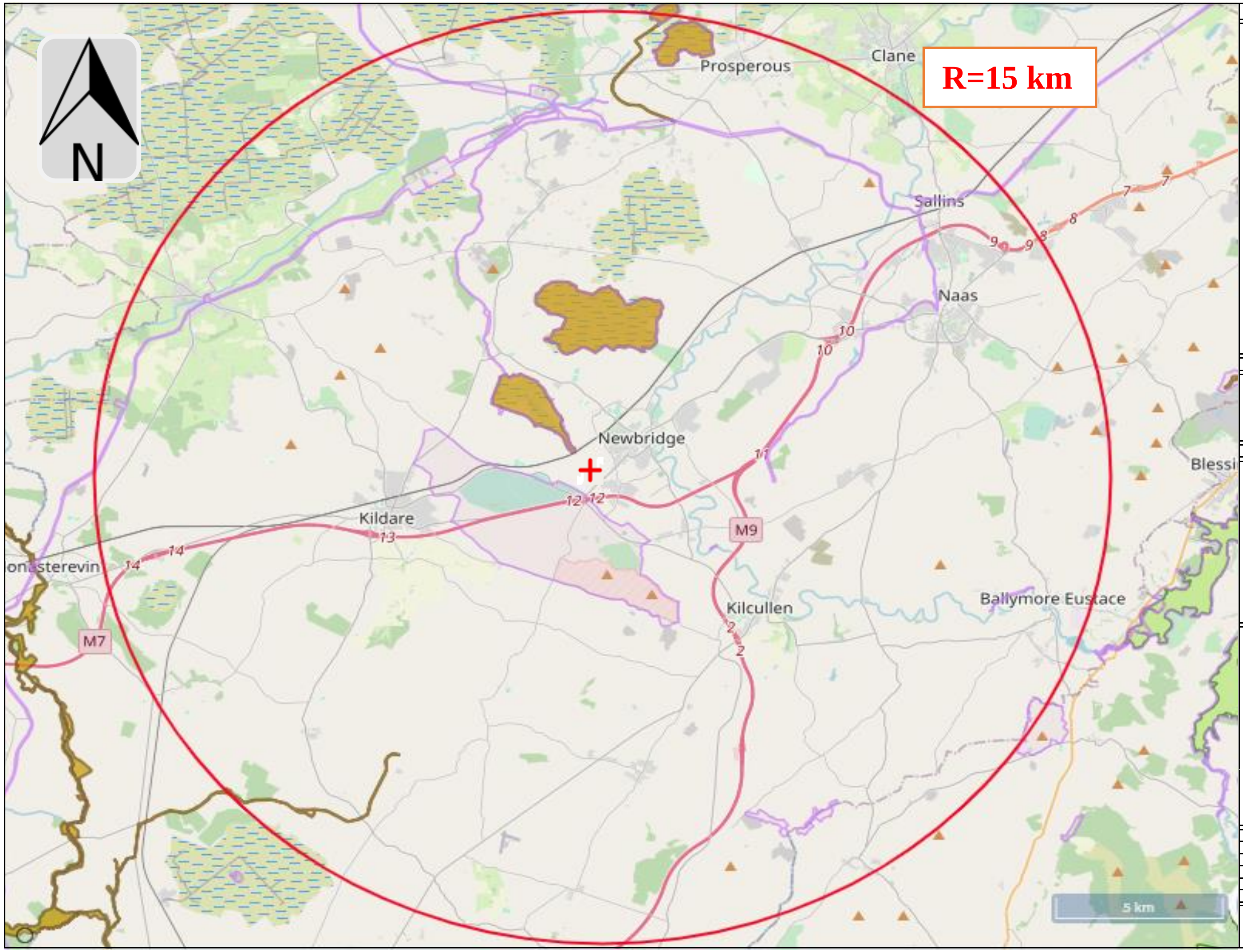
**PANTHER**

**ENVIRONMENTAL SOLUTIONS LTD**

**UNITS 3 & 4**
**INNOVATION CENTRE**
**GREEN ROAD**
**CARLOW**
**R93 W248**

**TELE: 059 91 34222**
**MOBILE: 087 851 9284**
**EMAIL: info@pantherwms.com**
**WEB: www.pantherwms.com**

| | | | |
|---|---|---|---|
| **Drawing Status:** | **Scale:** | NTS | A4 |
| Report | **Datum:** | EPA Envision | |
| **Drawing Number: EcIA 9794** | **Drawn:** | PES | |
| | **Checked:** | MF | |
| **Revision:** | **Approved:** | - | |
| R0 | **Date:** | 10/08/2020 | |



Notes

Site Location – +

S.P.A. – 🟩

S.A.C. – 🟫

pNHA - 🟨

Project Title:

PROTECTED SITES MAP

Client Name:

Briargate Developments Newbridge Limited

**PANTHER**

**ENVIRONMENTAL SOLUTIONS LTD**

**UNITS 3 & 4**
**INNOVATION CENTRE**
**GREEN ROAD**
**CARLOW**
**R93 W248**

**TELE: 059 91 34222**
**MOBILE: 087 851 9284**
**EMAIL: info@pantherwms.com**
**WEB: www.pantherwms.com**

| | | | |
|---|---|---|---|
| **Drawing Status:** | **Scale:** | NTS | A4 |
| Report | **Datum:** | EPA Envision | |
| **Drawing Number: EcIA 9794** | **Drawn:** | PES | |
| | **Checked:** | MF | |
| **Revision:** | **Approved:** | - | |
| R0 | **Date:** | 10/08/2020 | |

# Appendix 5.2
## - PHOTO LOG -

Plate 1: Recolonising bare ground (ED3) habitat

Plate 2: Exposed sand, gravel or till (ED1) habitat.

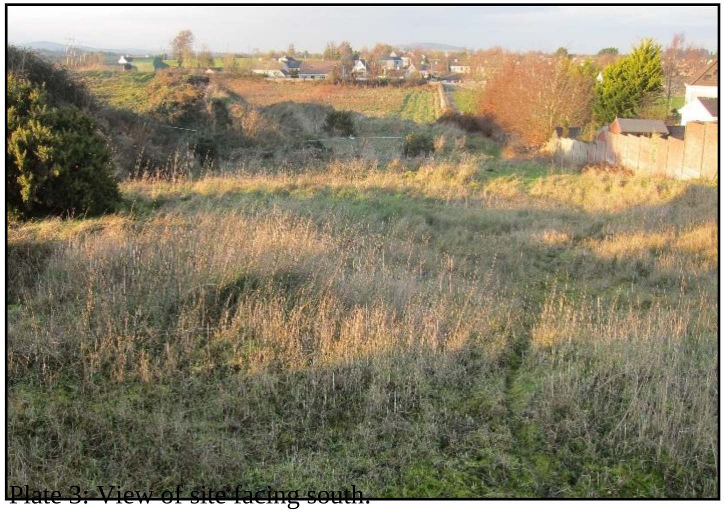


Plate 3: View of site facing south.

Plate 4: Hedgerows (WL1) habitat.

Notes:

**BALLYMANY,**
**NEWBRIDGE,**
**CO. KILDARE**

**APPENDIX B**
**PHOTO LOG**

PANTHER
ENVIRONMENTAL
SOLUTIONS LTD

UNITS 3 & 4
INNOVATION
CENTRE
GREEN ROAD
CARLOW

TELEPHONE: 059 91 34222
MOBILE: 087 851 9284
EMAIL: info@pantherwms.com
WEB: www.pantherwms.com

| | | | |
|---|---|---|---|
| file location: | | scale: N/A | A4 |
| drawing status: | REPORT | datum: | N/A |
| | | drawn: | PES |
| drawing no. | rev | checked: | MF |
| EIAR_21367 | A | approved: | - |
| | | date: | 14/01/2022 |

Plate 5: Scrub (WS1) habitat

Plate 6: Development site facing north

Plate 7: Other artificial lakes and ponds (FL8) habitat

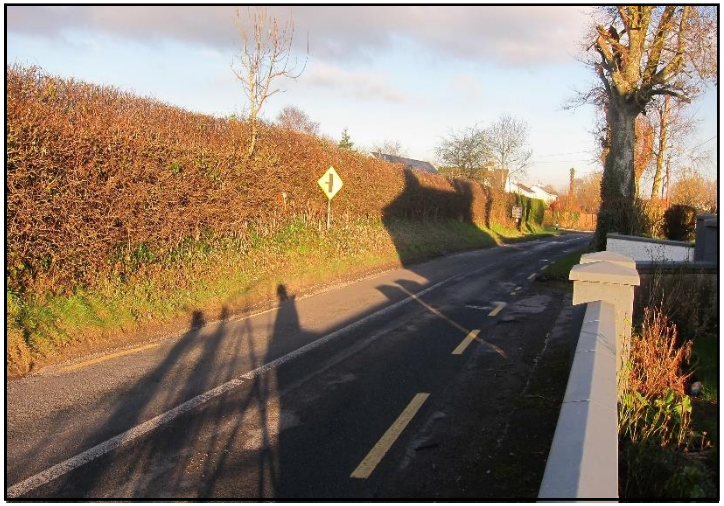


Plate 8: Standhouse Road facing east from site boundary

Notes:

**BALLYMANY,**
**NEWBRIDGE,**
**CO. KILDARE**

**APPENDIX B**
**PHOTO LOG**

PANTHER
ENVIRONMENTAL SOLUTIONS LTD

| | | | |
|---|---|---|---|
| **UNITS 3 & 4**<br>**INNOVATION**<br>**CENTRE**<br>**GREEN ROAD**<br>**CARLOW** | **TELEPHONE:**<br>**MOBILE:**<br>**EMAIL:**<br>**WEB:** | **059 91 34222**<br>**087 851 9284**<br>info@pantherwms.com<br>www.pantherwms.com | |

| | | | |
|---|---|---|---|
| file location: | | scale: N/A | A4 |
| drawing status: REPORT | | datum: | N/A |
| | | drawn: | PES |
| drawing no. | rev | checked: | MF |
| EIAR_21367 | A | approved: | - |
| | | date: | 14/01/2022 |

# 6. LAND, SOILS & GEOLOGY

## 6.1 Introduction & Methodology

This chapter of the Environmental Impact Assessment Report has been prepared by Muir Associates, Consulting Engineers and deals with the topics of Land, Soils and Geology and examines the potential impacts of the proposed development in the context of these topics.

The methodology used in assessing the impact of the proposed development in this chapter has primarily relied on desk top studies of the information available from the Environmental Protection Agency (EPA) website, the Geological Survey of Ireland (GSI) website and information contained in the geotechnical ground investigations carried out on the site for the proposed development.

## 6.2 Description of Receiving Environment

The proposed development site is located within the Ballymany area to the southwest of Newbridge Town Centre in Co. Kildare. The subject site is located on the north-western side of the R445 Ballymany Road, approximately 700m to the northeast of Junction 12 on the M7 Motorway, opposite Ballymany Manor. The site is bounded to the southeast and northeast by existing residential developments and to the southwest and northwest by agricultural lands. The site of the proposed development is zoned for residential use.

The existing ground levels on the subject site vary from approximately 105.0mAOD in the southwest of the site to 95.0mAOD in the northwest of the site. Sand and gravel extraction was carried out on the southern half of the site lands on foot of planning permission (KCC Ref. 06/547), which was put into effect in respect of this part of the permitted development. Currently, these lands within the subject site present an excavated landscape, with mounds of overburden dispersed over a significant part of the site. The northern, unexcavated lands within the subject site were used for arable farming.

The overall area of the subject site is c. 11.4 ha.

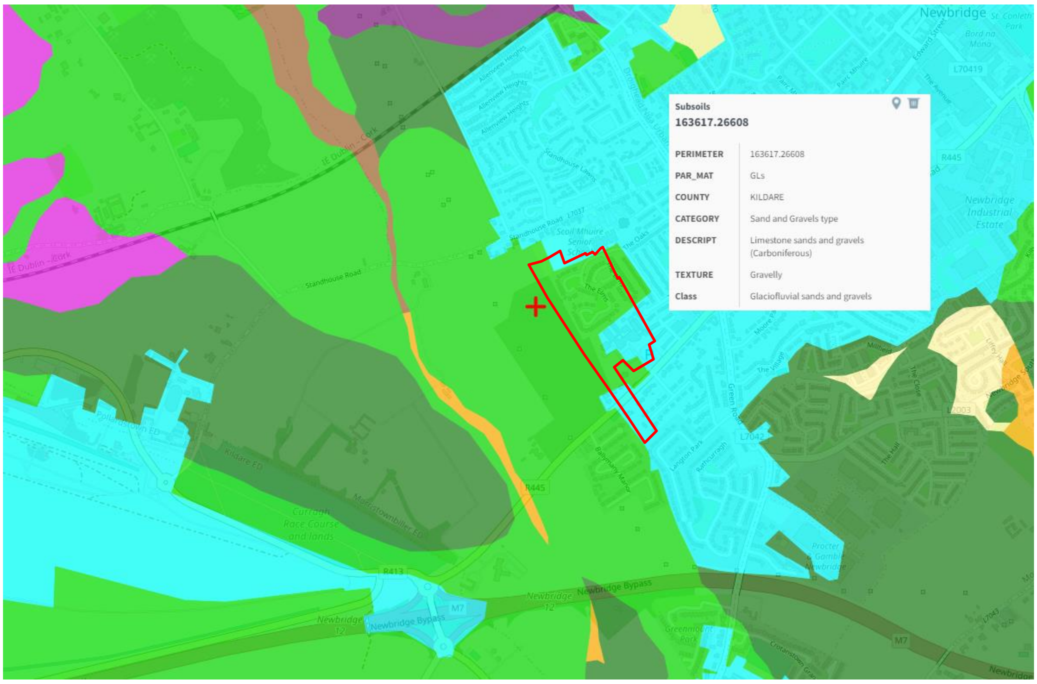
The proposed development site benefits from a previous planning permission (Kildare County Council File Number 16/658; ABP Reference PL09.249038) which was granted by An Bord Pleanála in April 2018 for the construction of 280 No residential units together with a Creche and a 103 No bedroom nursing home. A phase of this permitted development comprising 54 No residential units together with related infrastructure including a section of the link road from the L7042 Green Road to the L7037 Standhouse Road is currently under construction on the site. The balance of the site is greenfield/fallow land. Figure 6.1 presented below extent of previous excavation on the site.

**Figure 6.1: Aerial Image of the Proposed Development Site Illustrating the Extent of Previous Excavation on the Site;**

Reference to the GSI and EPA web based mapping for the area indicates the following:

### 6.2.1 *Soils and Subsoils*

The GSI data indicates that the soils at the site consist of glaciofluvial sands and gravels which have a material description as limestone sands and gravels (Carboniferous) and the related IFS Soil Code is BminSW which is categorised as a shallow well drained mineral derived from mainly calcareous parent materials. Figure 6.2 presented below is an extract from the GSI subsoils map for the area.



**Subsoils**

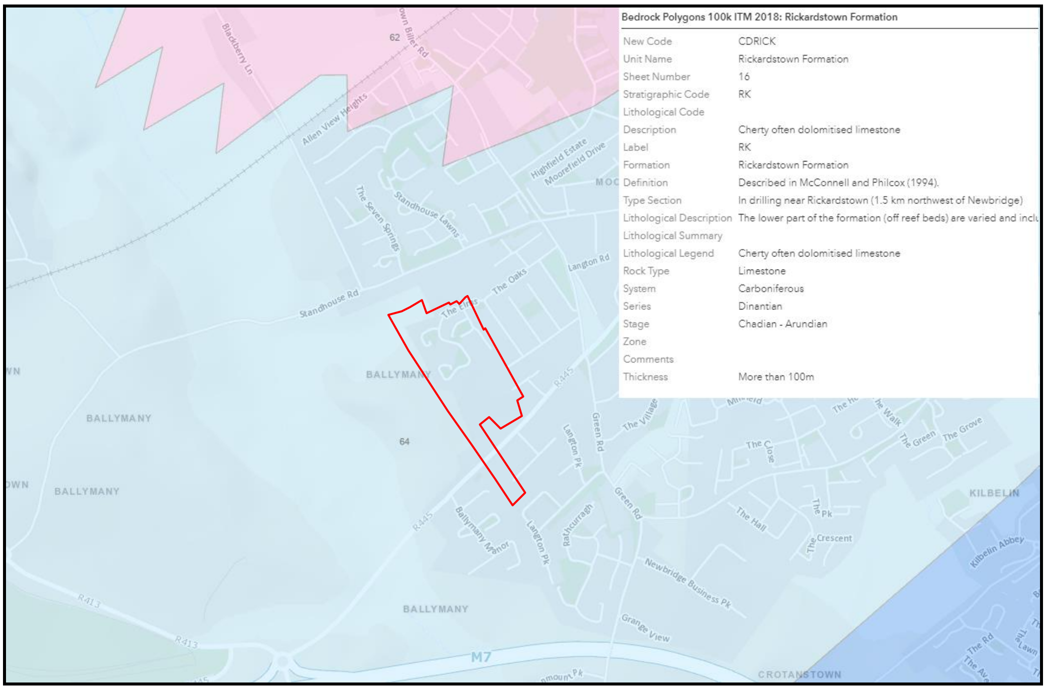
**163617.26608**

| | |
|---|---|
| PERIMETER | 163617.26608 |
| PAR_MAT | GLs |
| COUNTY | KILDARE |
| CATEGORY | Sand and Gravels type |
| DESCRIPT | Limestone sands and gravels (Carboniferous) |
| TEXTURE | Gravelly |
| Class | Glaciofluvial sands and gravels |

Figure 6.2: Extract from GSI Subsoils Map;

### 6.2.2 *Bedrock Geology*

The GSI mapping indicates the solid geology at the site to comprise Cherty often dolomitised limestone of the Rickardstown Formation (RK). The lower parts of the formation (off reef beds) are varied and include thinly interbedded nodular crinoidal, often cherty micrite and fossiliferous shale, with scattered reef derived conglomerates. The upper part is more uniform, moderately dark-grey. Figure 6.3 presented below is an extract from the GSI Bedrock Geology map for the area.



**Bedrock Polygons 100k ITM 2018: Rickardstown Formation**

| | |
|---|---|
| New Code | CDRICK |
| Unit Name | Rickardstown Formation |
| Sheet Number | 16 |
| Stratigraphic Code | RK |
| Lithological Code | |
| Description | Cherty often dolomitised limestone |
| Label | RK |
| Formation | Rickardstown Formation |
| Definition | Described in McConnell and Philcox (1994). |
| Type Section | In drilling near Rickardstown (1.5 km northwest of Newbridge) |
| Lithological Description | The lower part of the formation (off reef beds) are varied and inclu |
| Lithological Summary | |
| Lithological Legend | Cherty often dolomitised limestone |
| Rock Type | Limestone |
| System | Carboniferous |
| Series | Dinantian |
| Stage | Chadian - Arundian |
| Zone | |
| Comments | |
| Thickness | More than 100m |

Figure 6.3: Extract from GSI Bedrock Geology Map;

### *6.2.3 Geotechnical Ground Investigations*

Two relevant geotechnical ground investigations have been undertaken on the site, by Causeway Geotech in December 2018, and by IGSL in April 2021. The following descriptions of the soil strata have been based on the information contained in these investigations:

- Topsoil
- Made Ground
- Glacial Till
- Fluvioglacial Deposits
- Glacial Sands & Gravels
-

Topsoil was encountered in a number of the exploratory holes and the thickness of the layer was recorded as 200mm.

A layer of Made Ground, described as loose brown slightly silty to silty SAND or sandy GRAVEL or soft to firm, locally stiff, brown grey slightly sandy to sandy gravelly CLAY/SILT, was encountered at the ground surface in a number of the exploratory holes in the southern section of site where historical stockpiles of soil have been placed. The thickness of the layer ranged from 0.5m to 1.3m.

Several exploratory holes across the site encountered a layer of Glacial Till below the topsoil and/or Made Ground. The description of the layer on the logs was variable, ranging from grey, brown slightly silty very sandy GRAVEL to firm or stiff red brown grey slightly sandy to sandy gravelly to very gravelly SILT with low cobble content, and likely represents variability in the deposition of the material during the glaciation processes. The top of the stratum was reported at 0 to 1.3 metres below ground level (mbgl), with a thickness ranging from 0.8m to 1.6m.

The majority of exploratory holes encountered a layer of Fluvioglacial Deposits which was described on the logs as stiff to very stiff brown slightly sandy slightly gravelly CLAY/SILT or medium dense to very dense silty to very silty slightly gravelly to gravelly SAND. The top of the stratum was reported at 0.5m to 4.6m mbgl with a thickness of 4.7m to 5.7m proven in two of the boreholes.

A number of the boreholes and one of the trial pits excavated on the site encountered Glacial Sands & Gravels at the base of the Glacial Till or Fluvioglacial Deposits. The stratum was described on the logs as very dense grey, brown silty slightly sandy to very sandy GRAVEL with low to high cobble content. The top of the layer was reported at 7.5m to 9.3m mbgl. The thickness of the layer was unproven.

Copies of the Geotechnical Ground Investigations undertaken by Causeway Geotech and IGSL on site are presented in Appendix 6.1 of this report.

## 6.3 Assessment of Potential Impacts

The potential impacts of the proposed development on the existing soils and geology can be divided into two categories, namely, the impacts during construction and the impacts during operation. An assessment of the potential impacts of the proposed development during construction and operational phases is presented in the following paragraphs.

### *6.3.1 Construction Phase*

The site of the proposed development is currently partly occupied by the contractors compound associated with the phase of the permitted development under construction on the site. The balance of the site is greenfield/fallow land. Thus, there will be a loss of an area of fallow land as a result of the proposed development.

It is anticipated that significant earthworks will be required during the construction of the proposed development. However, the proposed finished levels adopted on the site have sought, in so far as is feasible, to balance the cut and fill earthworks. The potential impacts associated with the construction phase of the proposed development is the excavation, handling, storage, processing and transport of earthworks materials. The estimated volume of earthworks (excavation and filling) anticipated during the construction phase is of order 35,000m$^3$. The potential risk to construction workers from contaminants during the earthworks is likely to be not significant. The impact to soils and geology are considered to be Minor and short term in nature. Construction activities may also involve noise, dust, odour and site traffic generation issues as well as potential contamination issues arising from the use of fuel storage tanks, vehicles and the use of paints and oils.

### *6.3.2 Operational Phase*

There is the potential for contamination of the soils and geology during the operational phase of the proposed development from hydrocarbon leaks from vehicular traffic which could potentially leak into the ground via the surface water drainage network. Such incidents have the potential to have a significant temporary impact.

## 6.4 Mitigation and Monitoring

### *6.4.1 Construction Phase*

Should soils become contaminated during the construction phase of the proposed development these soils will be stockpiled onsite, sampled, and tested against the waste acceptance criteria as set out in the appropriate National directives and such soils will be disposed of to a suitable receiving facility.

During the construction phase of the proposed development all appropriate measures will be taken to protect the geology of the site. Where possible an area will be left intact until construction is ready to begin. Stripping of the existing soils will not be undertaken until absolutely necessary to avoid any uncontrolled surface water runoff.

The potential pollution of the ground during the construction phase will be mitigated by the provision of appropriate controls and working methods. These methods will include bunding around diesel/petrol storage tanks and vehicle maintenance areas and the related provisions. These measures are set out in the Outline Construction Management Plan which is included as a standalone report accompanying this application.

Excavated subsoils will be reused as fill on site where possible. Any remaining volumes of unsuitable materials will be transported to the closest suitably licensed facility to be processed and reused in other construction projects in the vicinity, where possible.

### *6.4.3 Operational Phase*

The proposed development includes the provision of surface water attenuation and soakaways in a number of open space locations using proprietary geocellular storage units.

Bypass petrol interceptors will be fitted upstream of all soakaway and attenuation storage facilities and the surface water inflow pipes will incorporate catchpit manholes. It is proposed that the soakaways and geocellular attenuation storage facilities will be wrapped with a Permafilter Geotextile which will retain any oil contamination which escapes capture.

## 6.5 Assessment of Residual Impacts

### *6.5.1 Construction Phase*

The loss of fallow lands associated with the proposed development will result in a permanent Imperceptible Impact. It is likely that, with the implementation of the mitigation measures described above, the predicted impact of the construction phase of the proposed development will be Imperceptible.

### *6.5.2 Operational Phase*

It is likely that, with the implementation of the mitigation measures described above, the predicted impact of the operational phase of the proposed development will be Imperceptible.

## 6.6 Cumulative Impacts

The potential impact on the Land, Soils and Geology environments when considered in combination with other known projects in the immediate area, including the Phase 1 development on the lands, are likely to be long term but will be imperceptible – provided mitigation measures are implemented for each of the developments.

## 6.7 "Do Nothing" Scenario

In the event that the proposed development does not proceed then it is likely that the extant planning permission (Kildare County Council File Number 16/658; ABP Reference PL09.249038) will be implemented. In such circumstances the likely impacts will be similar to the impacts identified for the subject development.

## 6.8 Interactions

There is a potential for interaction as a result of the impacts of Land, Soils and Geology on the following environmental topics:

- Hydrology and Water;
- Noise and Vibration;
- Landscape and Visual;
- Archaeology;

# 7. HYDROLOGY & WATER

## 7.1 Introduction & Methodology

This chapter of the Environmental Impact Assessment Report has been prepared by Muir Associates, Consulting Engineers and deals with the topics of Hydrology and Water and examines the potential impacts of the proposed development in the context of these topics. The methodology used in assessing the impact of the proposed development in this chapter has primarily relied on desk top studies of the information available from the Environmental Protection Agency (EPA) website and on the available services record information provided by the service providers.

In considering the impact of the proposed development on the hydrological environment, the surface water outfall locations and their environs were considered in terms of sensitive surface water receptors and potential to impact upon them. This element is concerned with potential effects on the surface water regime (flooding, water quality and flow).

A Site-Specific Flood Risk Assessment has been completed by Muir Associates Consulting Engineers and is included as a standalone report accompanying this application and this report informed this Chapter of the Environmental Impact Assessment Report.

## 7.2 Description of Receiving Environment

The site of the proposed development is located within the catchment of the River Barrow (EPA Code 14B01) the source of which is at Glenbarrow in the Slieve Bloom Mountains in County Laois. The River Barrow is 192km long and flows into the sea at Waterford harbour.

The nearest watercourses to the proposed development site are the Cloncumber Stream (EPA Code 14C17) to the northwest and the Greatconnell Stream (EPA Code 09G15) to the east. The Cloncumber Stream is within the River Barrow catchment and the Greatconnell Stream is within the River Liffey (EPA Code 09L01) catchment. The Cloncumber Stream rises to the north of the Dublin-Cork railway line which is approximately 500m to the northwest of the proposed development site. The Greatconnell Stream rises approximately 500m to the east of the proposed development site. This stream is a tributary of the Newbridge Stream (EPA Code 09N05) which flows into the River Liffey. Figure 7.1 presented below illustrates the proposed development site in the context of the local hydrological environment.

There are two EPA water quality monitoring stations in the vicinity of the proposed development, on the River Liffey and on the Cloncumber Stream and these are listed below together with their locations and their Q Value and Status:

- Station ID RS09L010900 on the River Liffey located at the bridge in Newbridge; Q Value Score, 4; Q Value Status, Good;

- Station ID RS14C170100 on the Cloncumber Stream located at the bridge at Wheelam Crossroads; Q Value Score, 3-4; Q Value Status, Moderate;

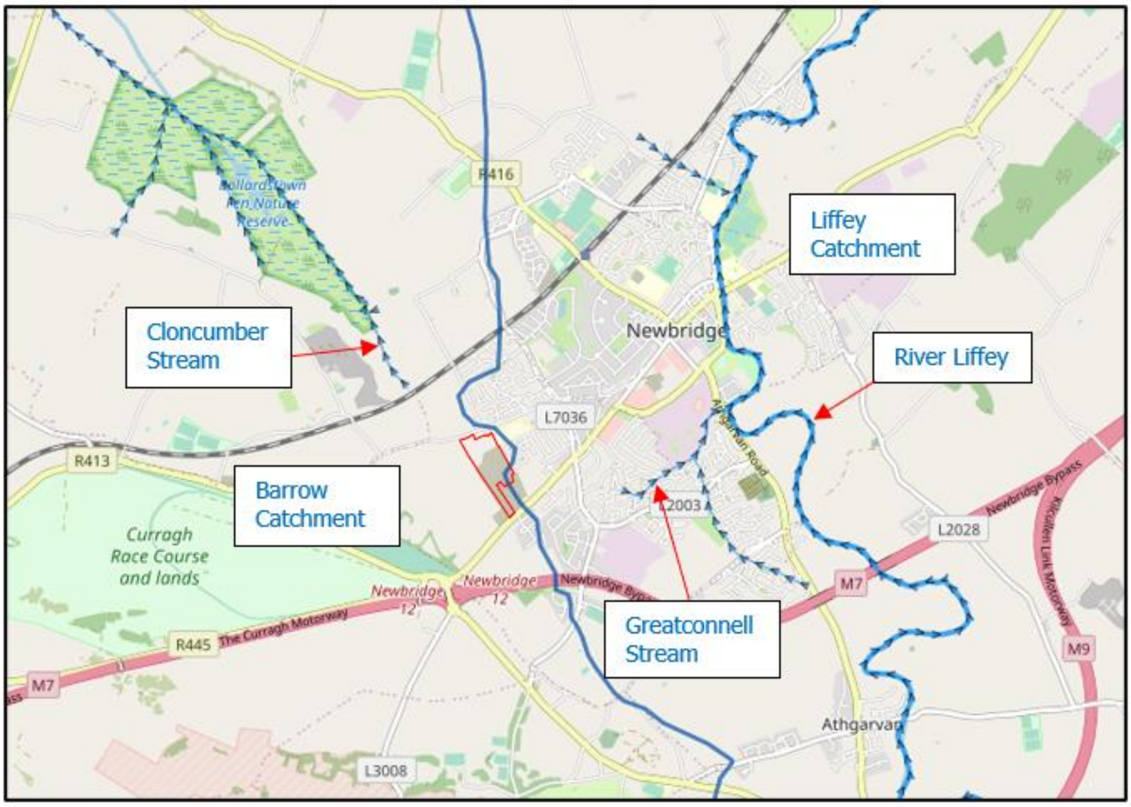


**Figure 7.1: Rivers and Catchments**

The OPW on-line database https://www.floodinfo.ie/ was examined with regard to incidences of historical regional and local flooding relevant to the area. The Summary Local Area Report does not indicate any record of flooding within the proposed development site. It does record a recurring flood event approximately 400m to the northeast of the site on the R445 Ballymany Road. The related report notes that the flooding appears to be related to runoff from the Hotel Carpark after significant heavy rain. A copy of the Summary Area report is presented in the Site Specific Flood Risk Assessment which is included as a standalone report accompanying this application.

There is an existing 225mm diameter surface water sewer in Standhouse Road at the junction of Standhouse Road and the access road to the existing Seven Springs housing estate. This existing surface water sewer flows in a north-easterly direction along the north-western edge of Standhouse Road and connects to the wider surface water drainage network serving Newbridge Town.

The site is located within the range of the Curragh Aquifer, which is an extensive, regionally important aquifer extending to 200km$^2$ in area. Due to its importance, it has been subject to detailed hydrogeological study and monitoring for a number of years, extending to decades. The bedrock aquifer vulnerability on the site is classified as High (H), decreasing to Moderate (M) to the southwest of the site.

Kildare County Council possesses good information on the hydrogeological structure of the Curragh Aquifer and its relationship to the Pollardstown Fen. In respect of the aquifer groundwater regime, there are a number (10) of static monitoring boreholes owned by Kildare County Council, which record the groundwater level within the Curragh Aquifer generally and within the vicinity of the site.

Geotechnical site investigations have been undertaken on the subject site which included the recording of the groundwater level and geological make-up of the subsurface strata across the subject site. Trial pits have been opened at each of the surface water drainage interventions on the subject site. Monitoring has been ongoing on the subject site since 2018. The subsoil strata are made up of till and sand and gravel profiles above groundwater levels. This is not a karst profile and the profile provides good infiltration.

The historical and ongoing independent recordings in respect of the Curragh aquifer and on-site testing provide robust and verifiable hydrogeological information. On-site excavations have provided information on depth to water table and sub-surface strata providing infiltration. This empirical information has been used to support conclusions in this EIAR.

There are a number of monitoring boreholes which record the groundwater level within the Curragh Aquifer in the vicinity of the site of the proposed development. Data provided by the EPA for five (5) monitoring boreholes owned by Kildare County Council have been examined. The boreholes examined were as follows:

- MB 07 adjacent to the L7032 near Pollardstown Fen;
- MB 29 at the western edge of the Curragh Racecourse;
- MB 30 at the western edge of the Curragh Racecourse;
- Brownstown to the south of Semaphore Hill near the junction of the L3006 and L7033;
- Ballysax at the eastern edge of the Curragh golf course;

The location of the five boreholes is illustrated in Figure 7.2 presented below:

Figure 7.2: Location of Monitoring Boreholes in the Vicinity of the Subject Site

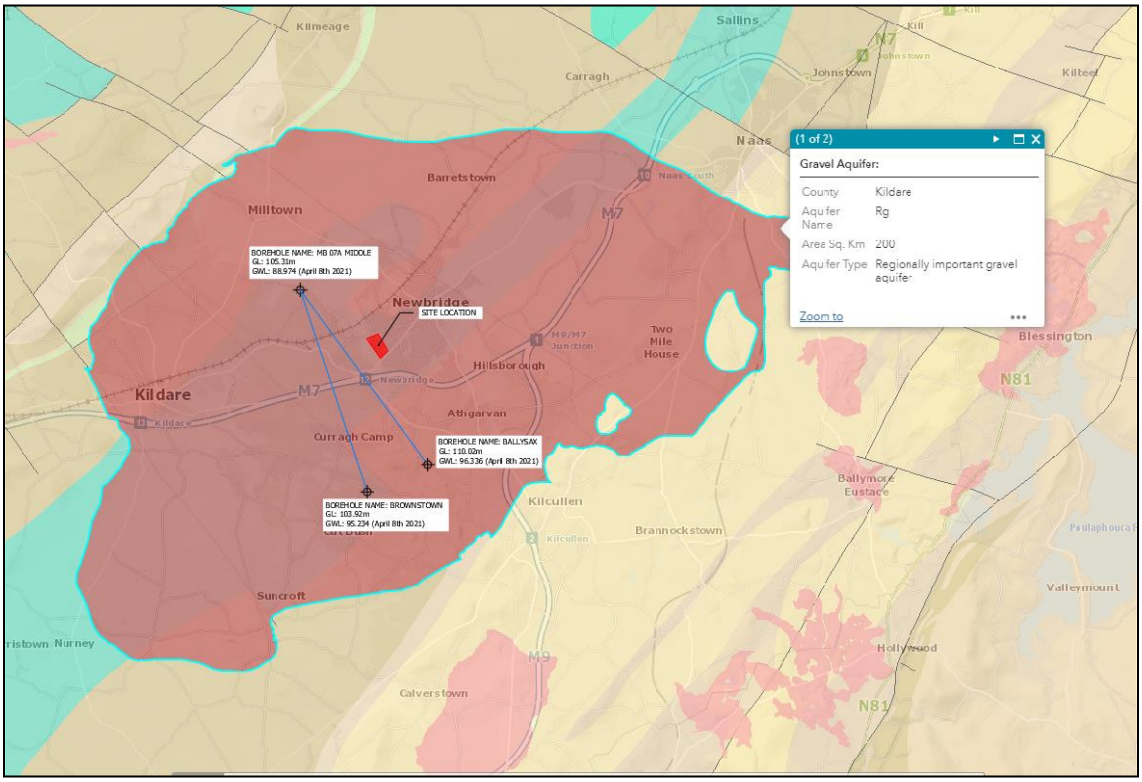
Each of these boreholes have been recording groundwater data for more than ten years. The data for the winter 2020 to spring 2021 period recorded the following groundwater levels during the period examined:

| **Borehole Ref** | **Ground Level (mAOD)** | **Min GW Level (mAOD) Nov. 2020** | **Max GW Level (mAOD) April 2021** | **Variation (m)** |
|---|---|---|---|---|
| MB 07A (Pollardstown Fen) | 105.31 | 87.62 | 88.974 | 1.35 |
| MB 30 | 97.57 | 88.7 | 90.55 | 1.85 |
| MB 29 | 97.55 | 88.7 | 90.6 | 1.90 |
| Brownstown | 103.92 | 93.32 | 95.23 | 1.92 |
| Ballysax | 110.02 | 94.45 | 96.34 | 1.89 |

The minimum recorded depth to groundwater in the monitoring boreholes examined was 6.95m (in the spring of 2021 in borehole reference MB 29 to the west of the Curragh Racecourse) and the maximum recorded depth to groundwater was 17.69m (in the winter of 2020 in a borehole near Pollardstown Fen).

The initial recorded depth to groundwater in the monitoring borehole on the subject site was 5.5m below ground level. This was likely perched groundwater as all subsequent recordings indicated no groundwater at a depth of 6.2m (the base of the monitoring borehole). Thus, the recorded information from the monitoring borehole on the subject site is consistent with the EPA recorded data. It is worth noting that the average seasonal variation in groundwater level in the five boreholes examined was 1.8m.

Figure 7.3 presented below illustrates the outline of the Curragh Aquifer taken from the GSI website on which the location of the subject site has been highlighted together with the location of the nearest relevant EPA boreholes and the recorded groundwater levels in April 2021.



(1 of 2)

Gravel Aquifer:

County Kildare
Aquifer Name Rg
Area Sq. Km 200
Aquifer Type Regionally important gravel aquifer

Figure 7.3: Outline of the Curragh Aquifer in the Context of the Subject Site

## 7.3 Assessment of Potential Impacts

### *7.3.1 Construction Phase*

During the construction phase of the proposed development the main potential impact in relation to the existing hydrology is the risk of pollution of surface water and groundwater due to elevated silt load as a result of construction activities and Hydrocarbons entering the surface water system as a result of an accidental spillage. Such incidents have the potential to have a significant temporary impact.

### *7.3.2 Operational Phase*

The main potential impact on surface water and ground water quality during the operational phase of the proposed development is the accidental spillage of oil or the lack of proper maintenance of the installed drainage systems. Such incidents have the potential to have a significant temporary impact.

## 7.4 Mitigation & Monitoring

### *7.4.1 Construction Stage*

It will be necessary for the contractor to implement measures to mitigate potential impacts to the existing surface water network and groundwater regimes. Such measures would include:

- Obtaining all necessary discharge permits and licences;
- Preparing a construction method statement;
- Provision of settlement ponds if required;
- Measures to prevent liquid materials entering the drainage system;

These measures are set out in the Outline Construction Management Plan which is included as a standalone report accompanying this application.

The surface water runoff during the construction phase will need to be managed properly to prevent the flow of silt laden surface water entering nearby watercourses. Plant and machinery used for the works should be stored in a secure area and related fuel storage should be stored in a properly bunded area.

### *7.4.2 Operational Stage*

The mitigation measures to be implemented during the operational phase of the proposed development will include the implementation of proper operation and maintenance regimes for the surface water drainage system in accordance with the recommendations of CIRIA 753, The SuDS Manual, to reduce the risk of human or mechanical error causing a pluvial flood risk from blockages, etc.

It is worth noting that notwithstanding the fact that the subject site falls within the catchment of the River Barrow, the attenuated surface water discharge from the site will discharge into the River Liffey surface water catchment network via Standhouse Road. The proposed development will limit the surface water discharge from the site by the incorporation of SuDS measures, surface water infiltration and attenuation storage and flow control devices. These measures will ensure that the proposed development will not have any adverse impact on the existing flood risk or on adjoining land users or properties particularly downstream of the proposed development. A Site Specific Flood Risk Assessment prepared by Muir Associates and submitted under separate cover provides more detailed information about the flood risk associated with the proposed development.

## 7.5 Assessment of Residual Impacts

It is likely that, with the implementation of the mitigation measures described above, the residual impact of the construction phase will be short-term but not significant and the impact of the operational phase of the proposed development will be long term but will not be significant.

## 7.6 Cumulative Impacts

The potential impact on the Hydrology and Water environment when considered in combination with other known projects in the immediate area, including the Phase 1 development on the lands, are likely to be long term but will not be significant – provided mitigation measures are implemented for each of the developments.

## 7.7 "Do Nothing" Scenario

In the event that the proposed development does not proceed then it is likely that the extant planning permission on the lands (Kildare County Council File Number 16/658; ABP Reference PL09.249038) will be implemented. In such circumstances the likely impacts will be similar to the impacts identified for the subject development.

## 7.8 Interactions

There is a potential for interaction as a result of the impacts of Hydrology and Water on the following environmental topics:

- Biodiversity;
- Land, Soils and Geology;
- Material Assets;

# 8. AIR QUALITY & CLIMATE

## 8.1 Introduction

The air quality and climate chapter of this EIAR describes the existing air quality setting and potential effects on ambient air quality associated with the construction phase and operational phase of the proposed development at Ballymany, Newbridge, Co. Kildare. The subject matter of Climate Change is also discussed. The assessment methodology, existing air quality, likely significant impacts and recommended mitigation measures are described in the following sections. The assessment addresses the potential impact of the proposed development upon air quality and climate.

## 8.2 Competence & Expertise

Mr. Martin O'Looney has over seven years consultancy experience and has a BSc Degree in Environmental Science and Technology from Sligo Institute of Technology. Mr. Tom Madden has over three years consultancy experience and has a BSc Degree in Environmental Science from the University of Limerick.

## 8.3 Methodology

The following section describes the methodology that was adopted to assess the potential impacts of air contaminants from the proposed development site. This section has been prepared following a desktop review, which involved reviewing baseline air quality monitoring data for the area, the identification of existing air emissions sources and any sensitive receptors and the assessment of potential impacts to air quality resulting from the proposed development.

The assessment methodology included:

- Selection of relevant air quality assessment criteria.
- Characterisation of meteorological conditions in the region using observations from Casement Aerodrome.
- Characterisation of anticipated impacts from the construction and operational phases based upon guidance methodologies.
- Comparison of the potential impacts against the relevant air contaminant assessment criteria.
- Recommendation of mitigation measures, where required, to effectively remove or manage potential impacts.

The assessment has been conducted in line with guidance provided in:

- *Guidelines on the information to be contained in Environmental Impact Assessment Reports, Draft* August 2017 (EPA Ireland, 2017) – EIAR Guidelines
- SEA and Climate change: *Integrating Climate Change into Strategic Environmental Assessment in Ireland – Guidance Note* (EPA, 2015).

## 8.4 Regulatory Framework and Assessment Criteria

### ENVIRONMENTAL PROTECTION AGENCY ACTS 1992 AND 2003

The Environmental Protection Agency Act 1992 (EPA Act) and Part 2 of the Protection of the Environment Act 2003 are collectively referred to as the Environmental Protection Agency Acts 1992 and 2003. The Environmental Protection Agency Acts 1992 and 2003 provide for the management of air emissions from activities (meaning any process, development or operation) specified in the First Schedule of the Environmental Protection Agency Acts 1992 and 2003.

Section 4 (2) of the Environmental Protection Agency Acts 1992 and 2003 states that Air Pollution:
"*means the direct or indirect introduction to an environmental medium, as a result of human activity, of substances, heat or noise which may be harmful to human health or the quality of the environment, result in damage to material property, or impair or interfere with amenities and other legitimate uses of the environment, and includes -*
*(a)* *'air pollution' for the purposes of the Air Pollution Act 1987,*
*(b)* …………………….
*(c)* ……………………."

The Air Pollution Act 1987 (AP Act) is "*an act to provide for the control of air pollution and other matters connected with air pollution*". According to the AP Act "*'pollutant' means any substance specified in the First Schedule or any other substance (including a substance which gives rise to odour) or energy which, when emitted into the atmosphere either by itself or in combination with any other substance, may cause air pollution*''.

Section 4 of the AP Act states:
"*Air pollution" in this Act means a condition of the atmosphere in which a pollutant is present in such a quantity as to be liable to —*
- *(i) be injurious to public health, or*
- *(ii) have a deleterious effect on flora or fauna or damage property, or*
- (iii)*impair or interfere with amenities or with the environment.*"

Section 24 of the AP Act states:
- *(1) The occupier of any premises, other than a private dwelling, shall use the best practicable means to limit and, if possible, to prevent an emission from such premises.*
- *(2) The occupier of any premises shall not cause or permit an emission from such premises in such a quantity, or in such a manner, as to be a nuisance.*
- *(3) In any prosecution for a contravention of this section, it shall be a good defence to establish that—*
  - *(a) the best practicable means have been used to prevent or limit the emission concerned, or*
  - *(b) the emission concerned was in accordance with a licence under this Act, or*
  - *(c) the emission concerned was in accordance with an emission limit value, or*

*(d) the emission concerned was in accordance with a special control area order in operation in relation to the area concerned, or*
*(e) in the case of an emission of smoke, the emission concerned was in accordance with regulations under section 25, or*
*(f) the emission did not cause air pollution.*

Section 75 (1) the Environmental Protection Agency Acts 1992 and 2003 states: "*The Agency shall, in relation to any environmental medium and without prejudice to its functions under section 103, specify and publish quality objectives which the Agency considers reasonable and desirable for the purposes of environmental protection.*"

### AIR QUALITY IMPACT CRITERIA GUIDANCE

The Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC) was published in May 2008. It replaced the Framework Directive and the first, second and third Daughter Directives. The fourth Daughter Directive (2004/107/EC) will be included in CAFE at a later stage. The limit and target values for both Directives are outlined below.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) (DEHLG, 2011). It replaces the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and S.I. No. 33 of 1999.

The limit values of the CAFE Directive that were applied in this assessment are presented in **Table 8.1.**

**Table 8.1: Limit values of CAFE Directive 2008/50/EC**

| Air Contaminant | Averaging Period | Value (µg/m$^3$) | Basis of application of limit value |
|---|---|---|---|
| **CO** | 8-hour | 10,000 | Maximum |
| **$NO_2$** | 1-hour | 200 | Not to be exceeded more than 18 times in a calendar year |
| | Annual | 40 | Average |
| **$PM_{10}$** | 24-hour | 50 | 35th highest |
| | Annual | 40 | Average |
| **$PM_{2.5}$** | Annual | 25 | Average |
| **$SO_2$** | 1-hour | 350 | Not to be exceeded more than 24 times in a calendar year |
| | 24-hour | 125 | Not to be exceeded more than 3 times in a calendar year |

| | | | |
|---|---|---|---|
| | Annual | 20 | Average |

National Road Authority Guidance

The National Road Authority has published guidance for assessing dust impacts from road construction, *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (2011).*

**Table 8.2** provides a list of distances that dust could be expected to result in a nuisance from construction sites such as soiling, PM10 and impacts to vegetation. These distances present the potential for dust impacts with standard dust control measures in place. This has been used to determine the potential impact from the proposed site operations.

**Table 8.2: Assessing the Criteria for the Impact of Dust from Construction with Standard Mitigation in place. (National Road Authority)**

| **Source** | | **Potential Distance for Significant Effects from the Source (meters)** | | |
|---|---|---|---|---|
| **Scale** | **Description** | **Soiling** | **PM10*** | **Vegetation** |
| Major | Large construction sites, with high use of haul roads | 100m | 25m | 25m |
| Moderate | Moderate sized construction sites, with moderate use of haul roads | 50m | 15m | 15m |
| Minor | Minor construction sites, with limited use of haul roads | 25m | 10m | 10m |

* Significance based on the 2005 standard, which allows 35 daily exceedances/year of 50 µg/m

Construction dust has the potential to cause local impacts through dust nuisance at the nearest sensitive receptors (e.g. the residential properties located at the south-westerly site boundary). Construction activities such as earth excavation, moving and backfilling may generate quantities of dust, particularly in dry weather conditions.

There are no statutory limits for deposition of dust, and industry guidelines are typically employed to determine any impact. The TA Luft (German Government

Technical Instructions on Air Quality') states a guideline of 350 mg/m2/day for the deposition of non-hazardous dust.

This value will be used to determine the impact of residual dust as an environmental nuisance.

## GHG & CLIMATE CHANGE POLICY AND LEGISLATIVE FRAMEWORK

### Global Climate Change Response

Ireland is a party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, which together provide an international legal framework for addressing climate change. The Paris Agreement is the new legally binding, global agreement on addressing climate change under the UNFCCC. The Paris Agreement was adopted by 195 Parties to the UNFCCC, representing 95% of global emissions, at the twenty-first session of the Conference of the Parties to the UNFCCC in December 2015. The ratification of the Agreement by the European Union triggered its entry into force on 4 November 2016, the same date the Agreement was ratified by Ireland. This legally-binding Agreement, represents a global milestone in international efforts to achieve a peaking of greenhouse gas emissions as soon as possible and to achieve net zero emissions by the second half of the century.

Each party to the agreement must commit to a Nationally Determined Contribution (NDC) that will increase in ambition over time, with progress being tracked by a series of global stocktakes, to be held every five years, starting in 2023. Ireland's contribution to the Paris Agreement will be via the NDC tabled by the EU on behalf of its Member States. The EU as a whole has committed to reducing its greenhouse gas (GHG) emissions by at least 40% by 2030, compared to 1990 levels.

### European Union Response

The European Council (EC) is committed to an EU objective of reducing GHG emissions by 80-95% by 2050 compared to 1990. Complimentary to this the EU has adopted interim objectives for 2020 and 2030:

- 2020 – reduce GHG emissions by 20% compared to 1990 levels
- 2030 – reduce GHG emissions by 40% compared to 1990 levels.

These objectives will be achieved through a combination of the EU Emissions Trading Scheme (ETS) and individual targets for each EU Member State for non-ETS sectors. Negotiations on these draft Effort Sharing Regulation (ESR) proposals are ongoing. Complementary to this the EC's Climate and Energy Framework includes binding targets of 27% renewable energy and an energy efficiency increase of at least 27% across the EU.

## National Policy and Long-Term Vision

In 2014, the Government adopted the *National Policy Position on Climate Action and Low Carbon Development (National Policy Position)*. The National Policy Position establishes the fundamental national objective of achieving transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out the context for the objective, clarifies the level of greenhouse gas mitigation ambition envisaged and establishes the process to pursue and achieve the overall objective. Specifically, the National Policy Position envisages that policy development will be guided by a long-term vision based on:

- An aggregate reduction in carbon dioxide ($CO_2$) emissions of at least 80% (compared to1990 levels) by 2050 across the electricity generation, built environment and transport sectors
- In parallel, an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production.

With 2015 GHG emission as a starting point, this equates to average annual reductions of 0.75Mt$CO_2$, compared to the projected position in 2035, which would require average annual reductions of almost 2 Mt$CO_2$. Highlighting the need for earlier action. *The White Paper on Energy Policy, Ireland's Transition to a Low Carbon Energy Future* 2015-2030 recognises that a radical transformation of Ireland's energy system is required to meet national, EU and international climate objectives and sets a course for an energy sector where the State will provide the supports that enable consumers to become active energy citizens. The vision is to reduce GHG emissions from the energy sector by between 80% and 95% compared to 1990 levels by 2050, while ensuring that secure supplies of competitive and affordable energy remain available to citizens and businesses. The White Paper sets out how the energy transition will depend on accelerated and diversified renewable energy generation, and a renewed focus on energy efficiency.

*The Climate Action and Low Carbon Development Act* 2015 provides the statutory basis for the national transition objective – the goal of progressively pursuing a low carbon, climate resilient and environmentally sustainable economy by 2050. It provides the legislative framework for the development and submission to Government for approval of national mitigation plans and national adaptation frameworks. This includes the institutional and governance framework for the development of these plans on a regular basis, together with independent advisory and Oireachtas accountability arrangements.

## EU Commitments

The EU ETS includes approximately 11,000 installations across the EU with 102 installation currently permitted in Ireland. It covers approximately 45% of total EU emissions and 28% of total emissions in Ireland.

The 2009 Effort Sharing Decision set individual Member State targets for non-ETS emissions out to 2020. Under this decision Ireland has an emissions reduction target for each year between 2013 and 2020. The 2020 target set for Ireland is that GHG emissions should be 20% below their 2005 level.

## 8.5 Description of Existing Environment

### *8.5.1 Local Terrain and Land Use*

The site is a currently comprised of areas of gravel hard-core surfaces and has a total area of 11.4ha. It forms part of a larger landholding and represents an extension to a previously permitted development at the southern end of the proposed development site. The initial phase of this development is currently under construction.

The proposed development site is located in a peri-urban area on the south-western outskirts of the town of Newbridge. Residential housing estates are located to the south, north and east of the proposed site whereas agricultural fields are located to the west. The regional R445 road which provides connectivity between Newbridge and the M7 motorway runs adjacent to the sites south-eastern boundary. The M7 motorway is at its closest to the site approximately 489m to the south of the site.

The terrain of the site and surrounding area are mostly flat. The site has an elevation of approximately 112 metres (m) above sea level. There are no major features in the region that would affect local wind flows.

As can be seen in Figure 8.1 below, the proposed development site is located within both an area of Urban Fabric – Artificial Surfaces and an area Pastures – Agricultural Areas.

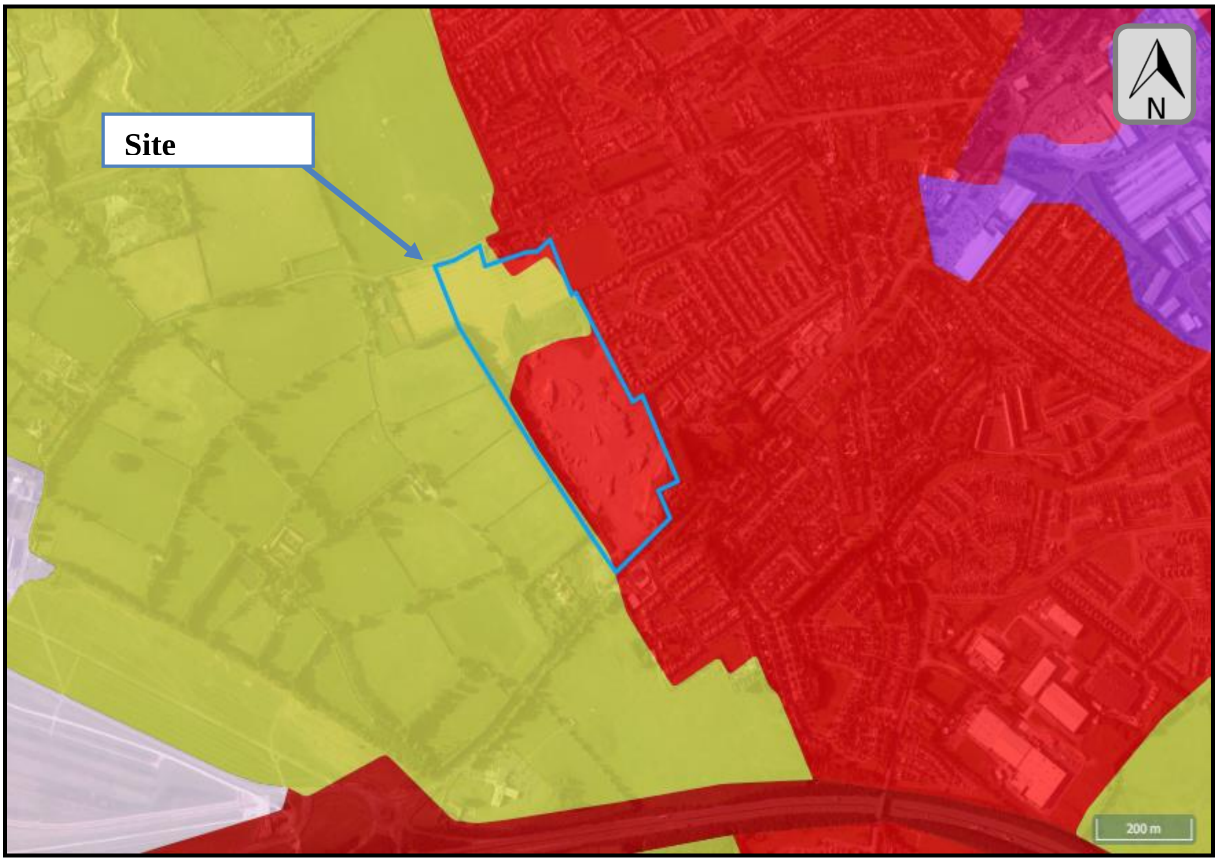


**Figure 8.1: Land Use in the Newbridge Area**

### *8.5.2 Sensitive Receptors*

The sensitive receptors that are of interest are located in close proximity to the Site. The closest sensitive receptors are presented in figure 8.2 and are as follows

- Sensitive Receptor 1 – Residential property adjacent to the site’s northern boundary,
- Sensitive Receptor 2 – Residential property approx. 13.2m to the east of the site boundary. This sensitive receptor is one of several houses which are all of equal distance from the site boundary. They are located in the The Elms housing estate,
- Sensitive Receptor 3 – Residential property approx. 142m south of the proposed site boundary,
- Sensitive Receptor 4 – Residential property approx. 123.79m to the west of the proposed site boundary.

**Figure 8.2: Nearest sensitive receptors to the proposed development site (Site Ownership – Blue and Site Boundary – Red)**

### *8.5.3 Background Air Quality & Climate*

#### 8.5.3.1 Background Air Quality

Under the Clean Air for Europe Directive, EU member states must designate "Zones" for the purpose of managing air quality. In Ireland, four zones are defined in the *Air Quality Standards Regulations 2011* (DEHLG, 2011).

The main areas defined in each zone are:

- Zone A: Dublin,
- Zone B: Cork,
- Zone C: Other cities and large towns comprising Limerick, Galway, Waterford, Drogheda, Dundalk, Bray, Navan, Ennis, Tralee, Kilkenny, Carlow, Naas, Sligo, Newbridge, Mullingar, Wexford, Letterkenny, Athlone, Celbridge, Clonmel, Balbriggan, Greystones, Leixlip and Portlaoise,
- Zone D: Rural Ireland, i.e., the remainder of the State excluding Zones A, B and C.

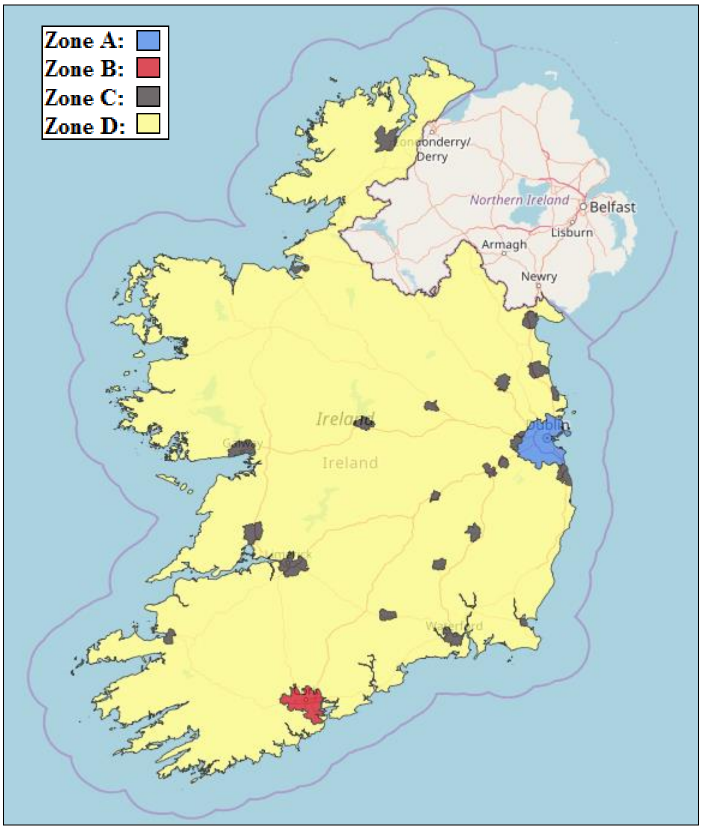


Figure 8.3: Air Quality Zones in Ireland

The proposed development site is Zone C, which is Other Cities and Large Towns.

Background air quality data for Zone C was obtained from three reports:

- Air Quality in Ireland 2017 – Indicators of Air Quality (EPA, 2018)
- Air Quality in Ireland 2018 – Indicators of Air Quality (EPA, 2019)
- Air Quality in Ireland 2019 – Indicators of Air Quality (EPA, 2020).

A summary of the background data that is relevant to the proposed development site is provided in **Table 8.3** below.

**Table 8.3: Ambient Background Air Quality Data**

| Pollutant | Averaging Period | Value ($\mu g/m^3$) | Source |
|---|---|---|---|
| **Nitrogen dioxide** | 1-hour | 93.15 | Average from other Zone C sites (Portlaoise, Navan, Waterford, Sligo, Dundalk) Air Quality in Ireland 2020, EPA |
| | Annual | 11.14 | Average from other Zone C sites (Portlaoise, Navan, Waterford, Sligo, Dundalk) Air Quality in Ireland 2020, EPA |
| **$PM_{10}$** | Daily Max | 69.93 | Average from other Zone C sites (Portlaoise, Navan, Waterford, Sligo, Dundalk) Air Quality in Ireland 2020, |

| | | | |
|---|---|---|---|
| | | | EPA |
| | Annual | 14.4 | Average from other Zone C sites (Portlaoise, Navan, Waterford, Sligo, Dundalk) Air Quality in Ireland 2020, EPA |
| **$PM_{2.5}$** | Annual | 9.5 | Average from other Zone C sites (Portlaoise, Navan, Waterford, Sligo, Dundalk) Air Quality in Ireland 2020, EPA |
| **Sulphur Dioxide** | 1-hour | 65.9 | Average from other Zone C sites (Portlaoise, Dundalk, Ennis) Air Quality in Ireland 2020, EPA |
| | 24-hour | 18.26 | Average from other Zone C sites (Portlaoise, Dundalk, Ennis) Air Quality in Ireland 2020, EPA |
| | Annual | 2.66 | Average from other Zone C sites (Portlaoise, Dundalk, Ennis) Air Quality in Ireland 2020, EPA |
| **Carbon Monoxide** | 8-hour Rolling | 1,100 – 1,200 | Maximum from Portlaoise and Dundalk 2020 |

* The data in the above table was sourced from the EPA published *Air Quality in Ireland 2020* Report using 2019 data. At the time of this Air Quality and Climate chapter being compiled, the most recent Air Quality Report from the EPA has not been published.

### 8.5.3.2 Background Greenhouse Gas Emissions

Ireland’s National Inventory Report 2021 (EPA, 2021b) is the official submission for Ireland for 2021 under the UNFCCC and the Kyoto Protocol. The National Inventory Report includes a detailed summary of national emissions for 2019 together with an overview of national emissions from 1990 until 2019. In 2019, total emissions of greenhouse gases including indirect emissions from solvent use in Ireland were 59,777.6 kt CO2 equivalent, which is 9.9 per cent higher than emissions in 1990.

**Figure 8.4** provides a pictorial summary of the sectoral contributions to national GHG emissions, broken down by percentage per sector.

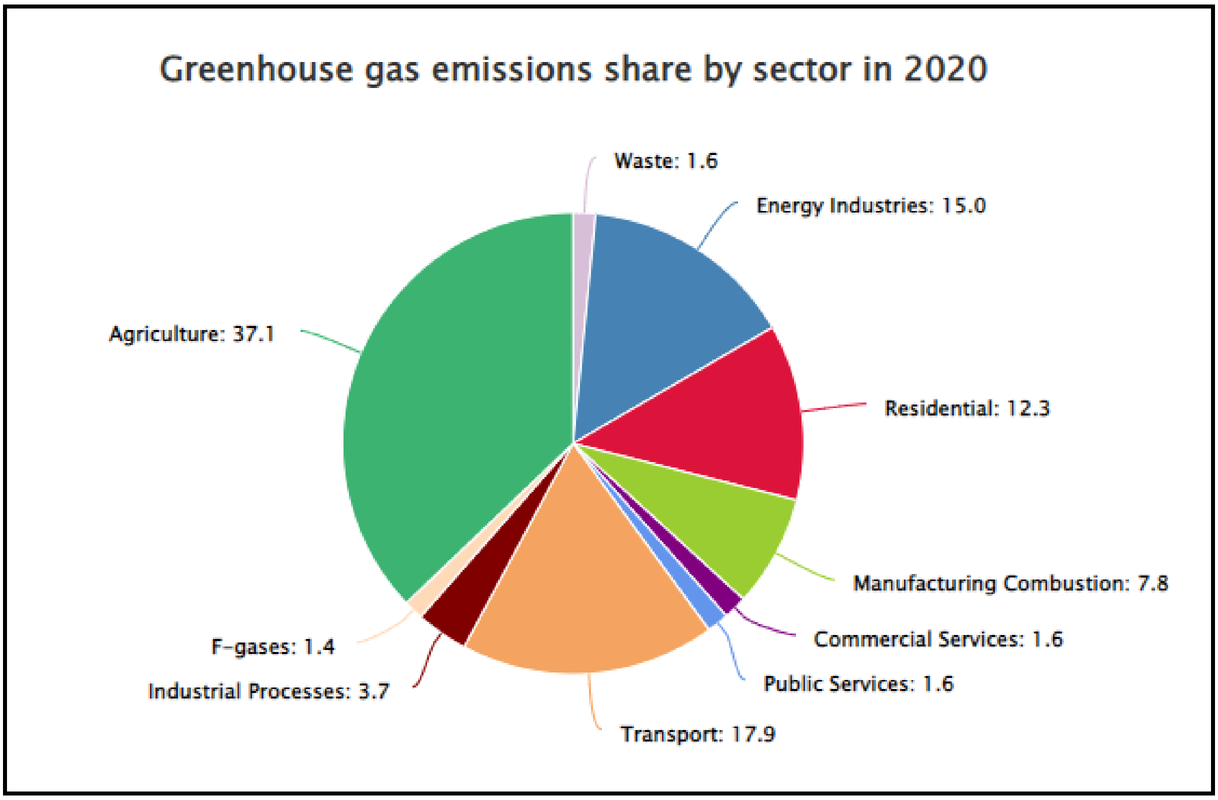


**Figure 8.4: GHG emissions Ireland 2020**

Residential greenhouse gas emissions account for 12.3 % of emissions in 2020.

### *8.5.3.3 Baseline Air Quality*

The EPA and Local Authorities have undertaken air quality monitoring programs in recent years. The most recent annual report on air quality in Ireland is the *Air Quality in Ireland 2020.* The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments.

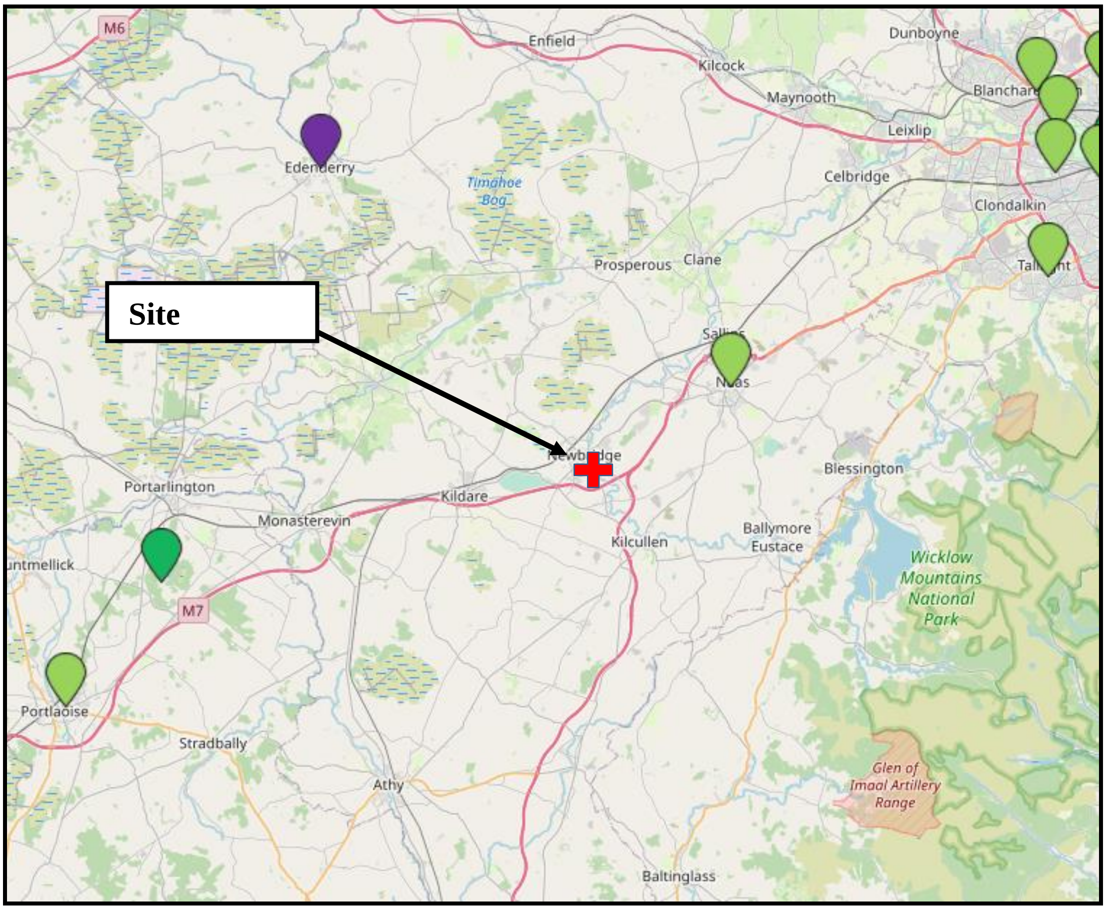


**Figure 8.5 – Current Air Quality Stations Close to the Proposed Site**

The town of Newbridge is in an Air Quality Zone C. The town of Naas, Celbridge and Leixlip are also located within Air Quality Zone C, whereas the rest of county Kildare is in Zone D.

Within Zone C (specified urban centres with populations in excess of 15,000)

- PM10 will need to be monitored continuously
- Levels of CO (Carbon Monoxide), $SO_2$ (Sulphur Dioxide), $NO_2$ (Nitrogen Dioxide), Benzene and Lead can be assessed using modelling or objective estimation techniques.

### *8.5.3.4 Trends in Air quality*

Air quality is variable and subject to both significant spatial and temporal variation. In relation to spatial variations in air quality, concentrations generally fall significantly with distance from major road sources (UK DEFRA 2007). Thus, residential exposure is determined by the location of sensitive receptors relative to major road sources in the area. Temporally, air quality can vary significantly by orders of magnitude due to changes in traffic volumes, meteorological conditions and wind direction.

### *8.5.3.5 Background Data*

The EPA and Local Authorities have undertaken air quality monitoring programs in recent years. The most recent annual report on air quality *Air Quality in Ireland 2020* (EPA 2017), details the range and scope of monitoring undertaken throughout Ireland.

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes. Zone A is the Dublin conurbation; Zone B is the Cork conurbation with Zone C comprising 23 large towns in Ireland with a population >15,000. Zone D is the remaining area of Ireland. In terms of air monitoring, Newbridge is categorised as Zone C.

In order to calculate the estimated background air quality for the proposed site, data from EPA monitoring stations within a 60 Km radius of the site was assessed, as monitoring has not been conducted within the vicinity of the proposed site. It should be noted that data from both Zone C and Zone D locations have been used, as can be seen in tables 5.5 and 5.6 below.

With regards to $NO_2$, monitoring data from the EPA monitoring stations at Navan, Portlaoise, Kilkenny and Emo Court (2020) shows that levels of $NO_2$ are below the annual mean limit with the exception of Navan. Based on this data a conservative estimate of the background $NO_2$ concentration in the Newbridge region is 9.5 µg/m$^3$, which is well below the limit of 40 µg/m$^3$.

With regards to PM10, monitoring data from the EPA monitoring stations at Navan , Portlaoise, Kilkenny and Carlow Town (2020) shows that levels of PM10 are below the annual mean limit. Based on this data a conservative estimate of the background PM10 concentration in the Newbridge region is 14 µg/m$^3$, which is below the limit of 40 µg/m$^3$.

With regards to $SO_2$, monitoring data from the EPA monitoring stations at Portlaoise and Emo Court (2020) shows that levels of $SO_2$ are below the annual mean limit. Based on this data a conservative estimate of the background $SO_2$ concentration in the Newbridge region is 2.3 µg/m$^3$, which is well below the limit of 20 µg/m$^3$.

With regards to CO, monitoring data from Portlaoise, Emo Court and Carlow Town (2020) show that levels of CO are below the rolling 8-hour mean limit of 10 mg/m$^3$ , with an average calculated level of 0.23 mg/m$^3$.

**Table 8.4 – Annual Mean Pollutant Concentrations within 60Km radius**

| Monitoring Station | Zone | Year | Annual Mean Pollutant Concentration µg/m$^3$ | | | |
|---|---|---|---|---|---|---|
| | | | $NO_x$ | $NO_2$ | PM10 | $SO_2$ |
| **CAFE Directive 2008/50/EC Limit** | | | **30** | **40** | **40** | **20** |
| Meath Navan | C | 2020 | 52 | 19 | 14 | - |
| Portlaoise | C | 2020 | 11.5 | 11 | 12 | 1.6 |
| Kilkenny | C | 2020 | 6.2 | 4 | 19 | - |
| Carlow Town | C | 2020 | - | - | 11 | - |
| Emo Court | D | 2020 | 4.7 | 4 | - | 3 |
| Average | | | 18.6 | 9.5 | 14 | 2.3 |

**Table 8.5 – Carbon Monoxide Rolling 8-Hour Mean (mg/m$^3$)**

| Station | Zone | Averaging Period | Year | Conc. |
|---|---|---|---|---|
| **CAFE Directive 2008/50/EC Limit** | | | | **10** |
| Portlaoise | C | Annual Mean | 2020 | 0.1 |
| Emo Court | D | Annual Mean | 2020 | 0.4 |
| Carlow Town | C | Annual Mean | 2004 | 0.2 |
| | | | Average | 0.23 |

As can be seen from the monitoring data above, air quality in Kildare and the surrounding regions continues to comply with national and international air quality standards for most pollutants. There are no issues with compliance for the pollutants, carbon monoxide, nitrogen dioxide or sulphur dioxide.

There were no recorded exceedance of any mean pollutant concentration with the exception of NOx concentrations in Navan, where an annual reading of 52 µg/m10 was recorded which is 22 µg/m10 over them limit.

### *8.5.3.6 Baseline Climate*

The dominant influence on Ireland's climate is the Atlantic Ocean. Consequently, Ireland does not suffer from the extremes of temperature experienced by many other countries at similar latitude.

Casement Aerodrome is the closest manned weather station to the proposed development site. This station opened in 1944 and is situated in the grounds of the Casement Aerodrome, Co. Dublin.

The average annual temperature is about 9 °C. In the middle and east of the country temperatures tend to be somewhat more extreme than in other parts of the country. For example, summer mean daily maximum is about 19 °C and winter mean daily minimum is about 2.5 °C in these areas.

Mean annual wind speed varies between about 4 m/sec in the east midlands and 7 m/sec in the northwest. Strong winds tend to be more frequent in winter than in summer. Sunshine duration is highest in the southeast of the country. Average rainfall varies between about 800 and 2,800mm.

### *8.5.3.7 Local Meteorology*

Meteorological parameters recorded at the closest Met Eireann Observation Station to the site at Casement Aerodrome were extracted and processed to assess meteorological conditions.

The observation station at Casement Aerodrome is approximately 29 km northeast of the proposed development site and approximately 89 m above sea level. The terrain surrounding the observation station is relatively flat. Land use in the area is predominantly urban with some areas of agricultural fields. The land between the observation station and the site is also primarily flat. The land surrounding the site and Casement Aerodrome monitoring station could be described as peri-urban. Casement Aerodrome is located on the western outskirts of the Greater Dublin Area. Land use between the proposed development site and the monitoring station is predominantly agricultural. The town of Naas is located between the proposed development site and Casement Aerodrome monitoring station. The River Liffey is located approximately 1.65km to the north-east od the proposed development site, which is oriented north to south at this point.

### *8.5.3.8 Wind-speed and Direction*

Wind speed and wind direction are important parameters for the transport and dispersion of air pollutants from a source. A wind rose representing the annual distribution of winds between 1985 and 2021 is shown below.

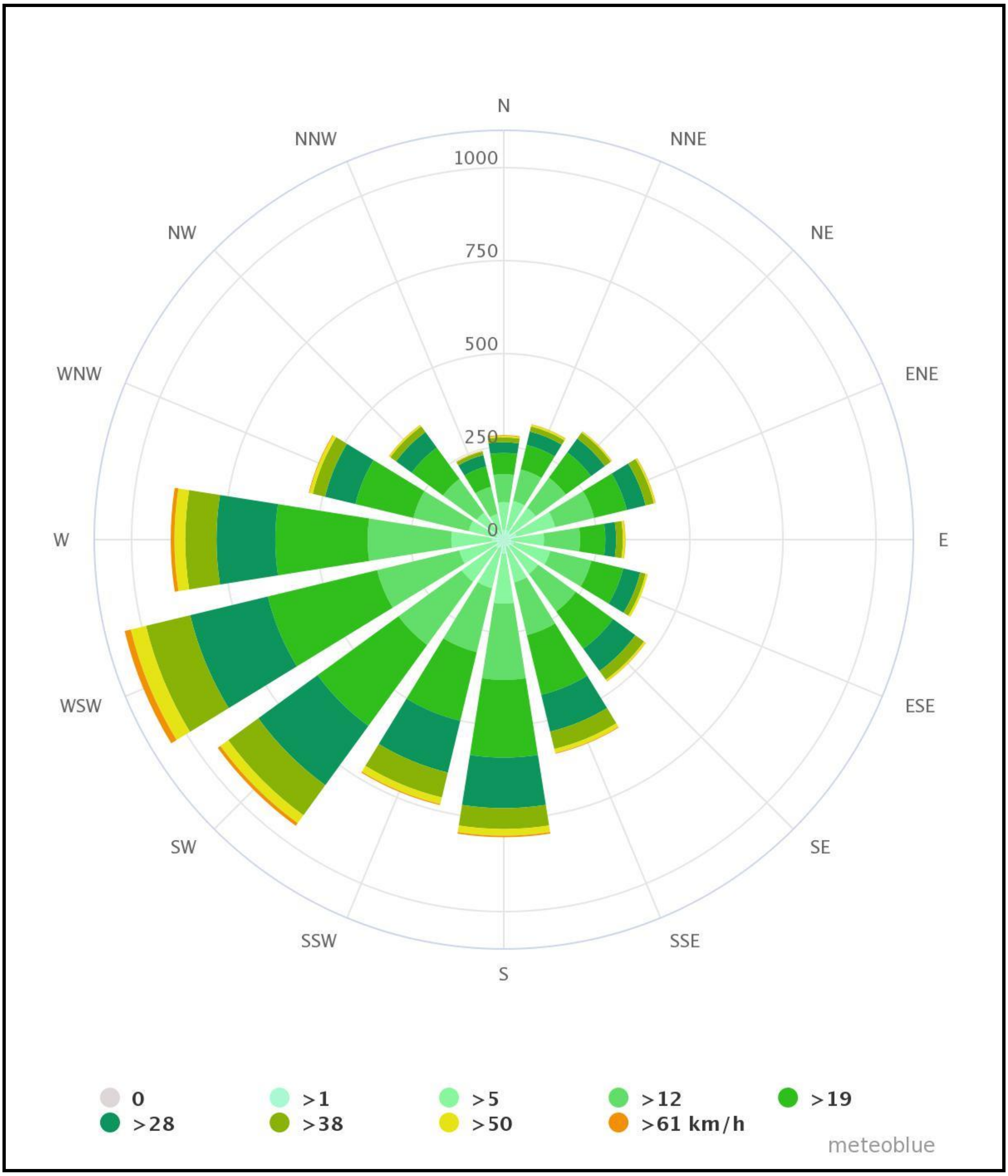


**Figure 8.6: Wind Rose for Newbridge, Co. Kildare**

As can be seen in the above wind rose, the prevailing wind direction is predominantly from the south and west. It is clear from **Figure 8.6** that these winds have a strong influence on wind patterns at Newbridge. Winds at all times of day are dominated by the prevailing wind directions.

The strongest winds at Newbridge occur most frequently from south to west during the winter months. Winds during summer are the lightest compared to other seasons.

### 8.6.1 *Characteristics of the Proposed Development*

Briargate Developments Newbridge Limited are seeking planning permission in relation to a Strategic Housing Development application to An Bord Pleanala for the following:

- Construction of 336 no. residential units consisting of 245 no. houses, 27 no. apartments and 64 no. duplexes.
- The 245 no. houses will comprise 2-storey, detached, semi-detached and terraced units to include: -
  - ➢ 17 no. 2-bed houses.
  - ➢ 184 no. 3-bed houses.
  - ➢ 44 no. 4-bed houses.
- The 27 no. apartments are located in a part 3-storey and part 4-storey building and include: -
  - o 13 no. 1-bed units.
  - o 13 no. 2-bed units.
  - o 1 no. 3-bed unit.
- The 64 no. duplexes are located across 6 no. 2 to 3-storey buildings and include: -
  - o 32 no. 1-bed units.
  - o 16 no. 2-bed units.
  - o 16 no. 3-bed units.
- A 2-storey creche.
- Car parking, bicycle parking, internal roads, services infrastructure, bin stores and bicycle stores.
- Footpath improvements along Standhouse Road.
- Landscaping, open spaces, play areas, boundary treatment and public lighting.
- All associated site works and services, at Ballymany, Newbridge, Co. Kildare.

The site is a currently comprised of areas of gravel hard-core surfaces and has a total area of 11.4ha. It forms part of a larger landholding and represents an extension to a previously permitted development at the southern end of the proposed development site. The initial phase of this development is currently under construction.

The proposed development site is located in a peri-urban area on the south-western outskirts of the town of Newbridge. Residential housing estates are located to the south, north and east of the proposed site whereas agricultural fields are located to the west. The regional R445 road which provides connectivity between Newbridge and the M7 motorway runs adjacent to the sites south-eastern boundary. The M7 motorway is at its closest to the site approximately 489m to the south of the site.

Construction works, are estimated to take five years over a phased basis, with hours of operation from 7.00am-19.00 Monday – Friday and 8.00-14.00 Saturday. A temporary site compound would be established housing the site offices, storage facilities and staff welfare facilities such as a canteen and toilets.

As per the surface water drainage system designed by the engineering consultants MUIR associates will consist of a drainage pipe network with inspection holes, tapped gullies and attenuation areas located within the green spaces of the proposed development. The runoff from the roof areas is considered to be clean runoff, free from silt and other contaminants while potential silts and hydrocarbons from the road network will be captured within the drainage system. Foul water will connect to the existing public sewer network along the R445 and connect with the local WWTP.

The heating system of the residential development will be Air to Water heat pumps.

Artificial outdoor lighting would be installed along the internal access network.

### *8.6.2 Potential Impact of the Proposed Development*

#### *8.6.2.1 Construction Phase - Air Quality*

The construction is to be carried out in a phased basis and would involve a number of activities including soil disturbance, excavation, foundation operations, concrete operations, handling and storage of fine materials, and use of construction traffic and plant equipment.

These activities generate particulate materials, including dust and PM10. The movement of machinery, construction vehicles and the use of plant equipment during the construction phase would also generate emissions of Sulphur Dioxide ($SO_2$), Nitrogen Oxides ($NO_x$), Particulate Matter (PM) and Carbon Monoxide (CO).

Increased construction road traffic arising from the proposed development would lead to a insignificant increase in levels of ambient air pollution at existing residential locations in the area.

Construction dust, particularly in dry weather conditions, has the potential to result in significant localised impacts in terms of dust nuisance at the nearest residences, and on other sensitive receptors, unless adequate dust control measures are implemented.

The following section describes the potential impacts on local air quality and nearby sensitive receptors resulting from work associated with the construction phase of the proposed development.

#### *8.6.2.2 Dust Emissions*

There is potential for a number of short-term negative impacts on air quality during the construction phase of the proposed development. Construction activities such as excavation, earth moving and backfilling may generate quantities of dust, particularly in dry weather conditions.

The short-term impact from dust also depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the source and as such any impacts form dust deposition will typically be close to the source, within several hundred metres of the construction compound.

Due to the nature of works to be carried out, the generation of airborne dust would be an air pollutant of concern during the construction phase. Dust generation is associated with materials handling (loading, unloading and storage) and excavation, site grading and similar activities resulting in the disruption of the existing land surface. Vehicles travelling on unpaved areas also have the potential to cause airborne dust.

Overall, the potential for uncontrolled dust emissions during the construction phase is largely related to local wind conditions (speed and direction), coupled with the frequency and duration of rainfall. Re-suspension of dust by the wind may occur from roads and other exposed surfaces, in particular during dry weather conditions. The wind speed will affect the dilution rate of exhaust emissions from trucks and machinery being used during the construction phase. Damp weather conditions substantially reduce the potential for dust and PM10 emission from roads and other exposed surfaces.

The proposed site has a residential housing estate located adjacent to the eastern boundary (The Elms), and further residential properties in close proximity to the northern and southern boundaries. Scoil Mhuire Senior School is also located c.123m north-east of the proposed development site. Therefore, there is a number of receptors that have the potential to suffer dust nuisance as a result of the construction phase of the proposed development. In order to mitigate this, a comprehensive set of dust mitigation measures are required, which are presented in **Table 8.6**.

**Table 8.6 – Assessing the Criteria for the Impact of Dust from Construction with Standard Mitigation in place. (National Road Authority)**

| **Source** | | **Potential Distance for Significant Effects from the Source** | | |
|---|---|---|---|---|
| **Scale** | **Description** | **Soiling** | **PM10** | **Vegetation** |
| Major | Large construction sites, with high use of haul roads | 100m | 25m | 25m |
| Moderate | Moderate sized construction sites, with moderate use of haul roads | 50m | 15m | 15m |
| Minor | Minor construction sites, with limited use of haul roads | 25m | 10m | 10m |

In accordance with best construction practice, dust control measures would form an integral part of the *Construction Management Plan/ Site Development Management Programme*. The measures include the installation of a temporary wheel-wash, construction phase protective hoarding, maintenance of the site entrance and access road, restriction of on-site truck and machinery operations, and cleaning of the public road where necessary. Adverse impacts, in terms of a community nuisance at nearby houses, other building and sites are unlikely to occur, following the effective implementation of a *Dust Control Management Plan* to control and reduce dust and PM10 emissions.

The overall impact on the existing air quality at the nearest receptors during the construction phase is predicted to be of a moderate - major negative impact. These impacts will be temporary and occur mainly during the initial site clearance work and preliminary build.

Once the construction of the outer fabric (roof, floor slabs, walls, windows, and doors) of all new buildings is completed, internal works will generate a very low quantity of emissions only.

### *8.6.2.3 Construction Traffic, Plant Equipment and Machinery*

The movement of machinery, construction vehicles and the use of generators within the site during the construction phase will generate exhaust fumes containing predominantly $SO_2$, $NO_x$, $CO_2$ and particulate matter (PM10). The concentration of these pollutants is expected to increase during the construction phase, however strict adherence to *good site & engineering practice* will minimise the generation of any unnecessary air emissions. The impact of emissions from plant equipment and machinery during the construction phase would be temporary in nature.

The main access to the proposed site would be from the R445 regional road which runs adjacent to the site's southern boundary.

Dust would be expected to occur due to trucks carrying excavation and fill materials from the site and from site workers private vehicles. While site staff trips would be expected to remain constant throughout the construction phase, the majority of the truck's trips would be expected to reduce dramatically once excavation works have been completed.

Additionally, construction traffic along the R445 Road, in the form of trucks transporting building materials to the site or hauling waste material off-site, has the potential to generate dust emissions. During construction, trucks and vans would be delivering materials to the site on a daily basis. The arrivals of deliveries to the site are expected to be evenly spread throughout the workday. Overall, the impact on local air quality from the trucks and machinery exhausts during the construction phase would be temporary and slight with no significant impact.

### *8.6.2.4 Climate*

The Environmental Protection Agency states that a development may have an influence on global climate where it represents *'a significant proportion of the national contribution to greenhouse gases'*. Due to the size and nature of the proposed development, greenhouse gas emissions resulting from the development would be insignificant in terms of national $CO_2$ emissions and the national agreed limits under the Kyoto Protocol. Thus, the impact of the proposed development on climate would be unnoticeable.

### *8.6.3 Operational Phase*

#### *8.6.3.1 Air Quality*

Operational activities involved with the new development would be non-industrial. There are no proposed major stationary sources associated with the operational phase of the project that could emit significant quantities of pollutants. Following the completion of construction activities, operational air emissions associated with the residential units will be limited to minor stationary sources from on-site utilities (i.e. home heating systems) and mobile sources from traffic generated as a result of the development. The following section discusses the effect on local air quality and climate associated with the operational phase of the proposed development.

#### *8.6.3.2 Stationary Source Emissions*

The nature of the proposed residential units and their associated activities are not major air emissions sources and do not include any major emission points. Subsequently, significant air quality and climate effects are not considered likely.

While significant effects on the global climate as a result of the development are not considered likely, improving the integrity of the building envelope (reduced heat loss) and other actions to reduce building energy consumption, can have a very significant impact on indirect emissions, which contribute to greenhouse gases and influence national greenhouse gas commitments.

The residential units which will be constructed as part of the proposed development will be heated by new Air to Water Heat pumps. This method of heating a house emits much less emissions in comparison to fossil fuel (Gas or Kerosene) burners.

#### *8.6.3.3 Mobile Source Emissions*

Vehicle movements generated as a result of the development will generate emissions to the atmosphere. However, in considering the expected number of future traffic movements to and from the site during the operational phase, any expected increase in air emissions is not considered likely to breach air quality standards or contribute substantially to an existing or projected air quality pollutant.

In determining the cumulative net increase of any criteria pollutant, the traffic volumes to be generated by the proposed development were considered in combination with traffic volumes on the local road network. The number of vehicles utilising the local road network, will not increase significantly as a result of the proposed development.

### *8.6.3.4 Potential Cumulative Impacts*

Cumulative impacts are those new impacts, or enhancements of existing impacts, that occur only as a result of the interaction of the construction and operation of the proposed development with existing developments.

Impacts may occur from the compounding of an issue (e.g. pollution from different sources affecting the same receptor) or from changes to the baseline (e.g. future development may change the air flow character and thus the impact of the development on the future baseline).

Sites currently under construction are assumed to be finalised by the time the construction phase for the proposed development begins. Hence, these may only have a cumulative impact during their operational phase. Sites currently under construction include residential and employment developments in the surrounding area. The closest current construction site is the Phase 1 stage of this development which has previously been granted planning permission. The construction of this development is ongoing and is subject to the same management controls as this proposed development.

There is also a recently permitted Strategic Housing Development (SHD) located to the south-west, on the opposite side of the R445 road. This is a significant residential housing development and has been granted permission to proceed subject to conditions set out by An Bord Pleanala (Ref: ABP-311040-21). Condition 18 refers to a Construction Management Plan and states "*The construction of the development shall be managed in accordance with a Construction Management Plan, which shall be submitted to, and agreed in writing with, the planning authority prior to commencement of development.*"

Proposed developments that have been approved or are likely to be approved can potentially have cumulative impacts with the proposed development during construction and operation phase. These include employment, residential and retail developments.

It is expected that the proposed developments will lead to an increase in traffic volumes in the area. However, as identified above, current air quality in the region is of good quality and the expected impact of both the construction and operational phases are anticipated to be minor due to the nature of the proposed development (Residential Housing Estate).

### *8.6.3.5 Construction Phase*

Cumulative impacts will only occur during the construction phase, if the construction of other nearby projects coincides with that of the proposed development. It is considered that the mitigation measures outlined in **section 5.6** are sufficient to ensure the cumulative impact will be effectively controlled during construction operations.

#### *8.6.3.6 Operational Phase & Climate*

It is anticipated that the proposed development will have a minor adverse impact on the closest properties to the site only.

According to Kildare County Council Local Area Plans, the lands where the proposed development site is located is zoned as C2 – New Residential. Lands surrounding the site are zoned as I - Agricultural, B – Existing Residential, E – Community and Education, L – Leisure and Amenity and J – Transport and Utilities.

The impacts of the proposed development on regional air quality and greenhouse gases are predicted to be negligible.

### *8.6.4 'Do Nothing' Impact*

The proposed development and associated traffic would not substantially contribute to or offset an existing or projected air quality pollutant. Therefore, no significant change in air quality or future air pollutant levels with the 'No Development' scenario is likely.

It should be noted that the construction phase of phase 1 of the project, which has previously been granted planning permission, is currently underway immediately adjacent to the proposed development site. Construction has been ongoing here and no issues have been reported to date with regards to air quality, dust or climate.

It is not anticipated that there will be any significant adverse impacts on the local air quality or climate as a result of the Phase 1 development during the operational phase. This is due to the nature of the development (Residential housing) and the type of heating which will be used (Air to Water).

Any potential air quality impacts are not anticipated to have a significant adverse effect on the local environment or receptors during the construction phase due to the comprehensive Construction Management Plan which has been compiled for this project. It should be noted that this Construction Management Plan is currently being implemented at the site and included a number of mitigation measures to prevent any potential impacts to air quality occurring.

## 8.7 Avoidance, Remedial & Mitigation Measures

It is considered that the proposed development will not result in any significant adverse impacts to air quality. Outlined below is a series of mitigation measures and good working practices to ensure that any potential impacts during the construction are minimised, and to ensure there will be no adverse impacts on the receiving environment. The mitigation measures have been sourced from international best practice guidance documents for the implementation of dust management plans, such as:

- *Control of Dust from Construction and Demolition Activities*, UK British Research Establishment (BRE).
- *Environmental Good Practice on Site*, Construction Industry Research and Information Association (CIRA),
- *Environmental Management Plans*, Institution of Environmental Management and Assessment (IEMA),
- *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan*, National Roads Authority (NRA).

### *8.7.1 CONSTRUCTION PHASE - Construction Phase Generation of Dust*

In order to mitigate dust emissions during the construction phase, a number of dust control measures have been included as part of the *Construction Management Plan* which has previously been prepared for the proposed development site. These dust control measures will be agreed with Kildare County Council (as part of Construction Management Plan).

The following dust control measures should be implemented on-site, for the control and reduction of dust and fine particulate emissions (PM10).

- Daily checks should be carried out on any operating mitigation equipment, exposed surfaces, stockpiles and public roads,
- A temporary wheel-wash facility should be installed close to the location of the site entrance, to prevent the hauling of silt and mud onto the local road surface by vehicles departing from the site.
- Exposed surfaces and entrances to the site should be dampened during dry windy conditions in the interest of controlling fugitive dust.
- Bulk fine-sized aggregates and other similar building materials that may easily become airborne by the wind should not be stored in uncovered stockpiles.
- Any spillage of material from vehicles departing the site should be promptly removed to prevent re-suspension of silt from the road surface by passing vehicles.
- Stockpiles and dust generating activities should, in so far as is possible, be located away from sensitive receptors and upwind areas,
- Dust control measures should be implemented on equipment used for drilling, pavement cutting, grinding of block surfaces and similar types of stone finishing, as significant fine particulate emissions can be generated which may cause a local nuisance.
- Truck speeds will be controlled within the development area to prevent high levels of dust being re-suspended from the construction area.
- Vehicles and plant machinery operating on-site will be properly maintained to prevent excessive emissions of particulates and other pollutants from the exhaust pipes.
- Where necessary, protective hoarding screens should be erected around construction activities, to reduce dust-blow from the site, in particular where the sensitive receptors are in close proximity.

### 8.7.1.2 Construction Traffic Emissions

Mitigation measures to minimise related traffic emissions include:

- Ensure regular maintenance of plant and equipment. Technical inspection of vehicles to ensure they perform most efficiently.
- All site vehicles and machinery will be switched off when not in use (i.e. no idling).

### 8.7.1.3 Climate

$CO_2$ and $NO_x$ emissions during construction will have a negligible impact on climate; therefore, no mitigation measures are required.

### 8.7.1.4 Operational Phase

Mitigation to ensure significant quantities of air pollutants are not generated during the operational phase has been incorporated into the design proposal.

The proposed energy and sustainability measures incorporated into the design of the building will improve energy efficiency at the development. High efficiency heating will reduce the energy input and $CO_2$ produced. Other electrical considerations including energy efficient lighting, shall allow for a further reduction in energy consumption.

### 8.7.1.5 Air Quality

It is considered that the operational phase of the development will not have a significant negative impact on the local air quality. Nevertheless, mitigation measures in relation to traffic-derived pollutants have focused generally on improvements in both engine technology and fuel quality. EU legislation, based on the EU sponsored Auto-Oil programmes, have imposed stringent emission standards for key pollutants for passenger cars to be complied with from 2009 (Euro V standard) and from 2014 (Euro VI standard).

With regards to heavy duty vehicles, EU directive 2005/78/EC defines the emission standard currently in focus, as well as the next stage which entered into force in October 2009. In addition, it defines a non-binding standard called *Enhanced Environmentally Friendly Vehicles* (EEV). In relation to fuel quality, S.I. No. 407 of 1999 and S.I. No. 72 of 2000 have introduced significant reduction in both sulphur and benzene content of fuels.

In relation to design and operational aspects of road schemes, emissions of pollutants from road traffic can be controlled most effectively by either diverting traffic away from the heavily congested area or ensuring free flowing traffic through good traffic management plans and the use of automatic traffic control systems.

Improvements in air quality are likely over the next few years as a result of the on-going comprehensive fuelled vehicles and the introduction of cleaner fuels and electric vehicles.

### 8.7.1.6 Climate

The impact of the proposed development on climate will be negligible, therefore no site-specific mitigation measures are required. Through EU legislation, on improvements in vehicle motor technology, and by an increased use of bio-fuels, $CO_2$ emissions for the average new car fleet were reduced to 120g/kg over the period 1995-2013. 15% of the necessary effort towards the overall climate change target of the EU was met by this measure alone.

The average emissions level of a new car sold in 2020 was 108 grams of $CO_2$ per kilometre (g $CO_2$/km), above the 2020 target of 95g/km. For the average new car purchased, CO2 emissions per kilometre fell by 32% between 2007 and 2017, reaching 112.0 g CO2/km in 2017.

Additions made to the *National Climate Change Strategy* include:

- VRT and Motor Tax rebalancing to favour the purchase more fuel-efficient vehicles with lower $CO_2$ emissions.
- Continuing the Minerals Oils Tax Relief (MOTR) II scheme and introduction of a bio fuel obligation scheme.
- Implementation of a national efficient driving awareness campaign, to promote smooth and safe driving at lower engine revs.
- Enhancing the existing mandatory vehicle labelling system to provide more information on $CO_2$ emission levels and on fuel economy.

### 8.7.2 Strategic Environmental Assessment – Kildare County Development Plan

The proposed development will also adhere to the appropriate mitigation measures, as per the Kildare County Development Plan Strategic Environmental Assessment, to minimise the impact of development on air and climate.

These measures were developed based on a number of international and national environmental policies such as the Kyoto Protocol, the National Emissions Ceilings, and the development management standards.

At a local level, Kildare County Council has a statutory function to place conditions on air emissions licences to ensure emissions from development or facilities do not affect the ambient air quality. The mitigation measures provided by public transport will help mitigate greenhouse gas emissions.

**Table 8.7 – Strategic Environmental Objectives – Air & Climate Factors**

| SEO | Objective |
|---|---|
| C1 | To reduce travel related emissions to air and to encourage modal change from car to more sustainable forms of transport |

In the absence of detailed information on the type and scale of developments, which may be proposed during the lifetime of the Development Plan, it is necessary to mitigate any uncertainty by including the following Objectives:

**Table 8.8 – Mitigation Measures – Air, Noise & Climate**

| **Potential Effect, if unmitigated** | **Mitigation Measures, including** |
|---|---|
| Emissions to air including greenhouse gas emissions and other emissions | • Policies EB 1, RE 10, GI 23 and LA 7,<br>• Objectives ERO 1,<br>• Overall approach by the Plan and all provisions relating to development and sustainable mobility in the County. |

### *8.7.3 'Worst Case' Scenario*

During the construction phase the 'worst case' impact would occur in the event that the dust control measures highlighted above (as part of Construction Management Plan) was not successful and dust nuisance occurred for sensitive receptors in the area. Should dust mitigation measures not be implemented during the construction phase, significant dust nuisance is likely in areas close to the construction site.

The generation of dust during the construction phase and minor air pollutants during the operational phase, cannot be totally eliminated. However, proposed energy technologies, good site management and strict adherence to the recommendations set out, will ensure fugitive dust emissions are kept to a minimum and air pollution emissions are controlled to within acceptable levels. Therefore, with the recommended mitigation in place, significant negative residual impacts are not predicted in relation to air quality.

## 8.8 Residual Impacts

Dust effects are transient in nature. For typical construction and residential dust sources, once dust sources cease or are suitably mitigated, there are no residual impacts.

Mitigation measures identified above in section 5.6 and in the related Construction Management Plan will prevent dust dispersion during the construction phase.

It is not anticipated that there will be any significant impact on air quality or climate as a result of the proposed development during the operational phase.

It is not anticipated that there will be any significant air quality impacts on nearby sensitive receptors during the operational phase due to the nature of the proposed development (Residential Housing).

No residual dust impacts are anticipated as a result of the proposed development.

## 8.9 Monitoring

### *8.9.1 Construction Phase*

It is recommended that monthly dust deposition survey be carried out along the boundary of the proposed site in order to monitor the effectiveness of dust management for the duration of the construction phase. The TA Luft (German Government *Technical Instruction on Air Quality)* states a guideline of 350mg/m$^2$/day for the deposition of non-hazardous dusts. This value should not be exceeded beyond the site boundary and any breaches will require a review of operations and dust mitigation measures.

### *8.9.2 Operational Phase*

Not Applicable

## 8.10 Interactions

In addition to the requirement to describe the likely significant effects of the proposed development on air quality and climate, it is also required to consider the interaction of those effects.

The proposed development has the potential to impact upon the air quality and climate of the area through air emissions, including potential greenhouse gases, arising from home heating systems and exhaust fumes from vehicles.

### *8.10.1 Climate and Human Beings*

The completed development will generate additional emissions to the atmosphere due to associated with the development, and due to plant equipment within the development. However, air quality in the region of the site is expected to be within the limits set by the air quality standard.

During construction there may be potential for dust nuisance in the immediate vicinity of the site. However, dust control measures, as set out in the *Construction Management Plan* which include a range of measures such as wheel washes and covering of fine materials will minimise the impact on air quality.

### *8.10.2 Air Quality and Soils*

Exposed soil during the construction phase of the proposed development may give rise to increased dust emissions. However, the implementation of the dust control measures listed in the *Construction Management Plan* will ensure that the proposed development will not give rise to the generation of any significant quantities of dust.

### *8.10.3 Air Quality and Material Assets*

The proposed development is located in a peri-urban area, with agricultural activities to the north and west. The production of dust during construction has a nuisance value and livestock may be at risk to eye irritation from high levels of wind blowing dust particles. Given the proposed mitigation measures for dust control and dust suppression, the potential for dust to impact upon livestock would be considered very low.

### *8.10.4 Air, Human Beings and Biodiversity*

An adverse impact on air quality has the potential to impact upon human health, cause dust nuisance and cause disturbance to fauna. However, the risk to air quality as a result of the proposed development would not be considered significant, both at the local community level and on a broader national / global scale.

During the construction phase of the development, there would be potential for dust emissions, which could impact upon the communities and residents on the roads to the site and fauna in the surrounding area. The potential impact of dust would be temporary, given the transient nature of construction works. Dust control would be an integral part of construction management practices, with mitigation measures implemented where required, including the installation of a wheel-wash facility, appropriate storage and transport of material and dust suppression measures where required.

It should be noted that an important interaction exists between air quality and flora, whereby vegetation can play an important role in acting as an air purifier by absorbing carbon dioxide and giving out oxygen. It would therefore be anticipated that potential carbon dioxide emissions generated by home heating systems and discharged from vehicle exhausts would be somewhat mitigated by vegetation in the environs of the site.

## 8.11 Difficulties Encountered in Compiling

There were no difficulties encountered in compiling any specific information regarding air quality and climate.

## 8.12 References

Environmental Protection Agency, 2017, *National Ambient Air Quality Monitoring Programme 2017-2022.*

Environmental Protection Agency, 2002, revised 2015 & 2017, *Guidelines on the Information to be contained in Environmental Impact Statement.*

Environmental Protection Agency, 2003, *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements.*

Environmental Protection Agency, 2006, *Environment in Focus – Environmental Indicators (Ireland).*

Environmental Protection Agency, 2015, *Ireland's Greenhouse Gas Emission Projections (2014-2015).*

Environmental Protection Agency, Accessed 2018, *Air Quality Data*
(Available at http://www.epa.ie/air/quality/data/)

Environmental Protection Agency, Accessed 2018, *Air Quality Standards*
(Available at http://www.epa.ie/air/quality/standards/)

Environmental Protection Agency, Accessed 2018, *Air Quality Zones*
(Available at http://www.epa.ie/air/quality/zones/)

Environmental Protection Agency, 2000 to 2016, *Air Quality in Ireland – Annual Reports*.

Environmental Protection Agency, 2012, *Ireland's Climate Strategy to 2020 and beyond.*

Environmental Protection Agency, 2017, *Irelands Provisional Greenhouse Gas Emissions 1990-2016.*

National Road Authority, 2006, revised 2011, *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes.*

National Road Authority, 2008, *Guidelines on Environmental Impact Assessment of National Road Schemes – A Practical Guide.*

*National Roads Authority, 2007, Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan.*

Framework Convention for Climate Change, 1997, *Kyoto Protocol to the United Nations Framework Convention on Climate Change.*

World Health Organisation, 2006, *Air Quality Guidelines – Global Update 2005.*

Department of the Environment, Heritage and Local Government, 2007, *National Climate Change Strategy 2007-2012.*

Kildare County Council, 2013, *Kildare County Development Plan 2017-2023.*

UK Department of Environment, Food and Rural Affairs, 2007, *Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3: Part I Ha 207/07 Air Quality*.

UK Department of Environment, Food and Rural Affairs, 2009, revised 2016, *Part IV of the Environmental Act 1995 – Local Air Quality Management – Policy Guidance (PG09, PG16).*

Royal Automobile Club Foundation, 2014, *Air Quality and Road Transport – Impacts and Solutions.*

UK Department of the Environment, Transport and the Regions, 1998, *Guide on Environmental Statements for Planning Projects That Require Environmental Assessment.*

UK British Research Establishment, 2003, *Control of Dust from Construction and Demolition Activities*.

Construction Industry Research and Information Association (CIRIA), 2010, *Environmental Good Practice on Site – Third Edition.*

Institution of Environmental Management and Assessment (IEMA), 2012, *Environmental Management Plans in Environmental Impact Assessments.*

# 9. NOISE AND VIBRATION

## 9.0 Introduction

Briargate Developments Newbridge Limited are seeking planning permission in relation to a Strategic Housing Development application to An Bord Pleanala for the following:

- Construction of 336 no. residential units consisting of 245 no. houses, 27 no. apartments and 64 no. duplexes.
- The 245 no. houses will comprise 2-storey, detached, semi-detached and terraced units to include: -
    - ➢ 17 no. 2-bed houses.
    - ➢ 184 no. 3-bed houses.
    - ➢ 44 no. 4-bed houses.
- The 27 no. apartments are located in a part 3-storey and part 4-storey building and include: -
    - 13 no. 1-bed units.
    - 13 no. 2-bed units.
    - 1 no. 3-bed unit.
- The 64 no. duplexes are located across 6 no. 2 to 3-storey buildings and include: -
    - 32 no. 1-bed units.
    - 16 no. 2-bed units.
    - 16 no. 3-bed units.
- A 2-storey creche.
- Car parking, bicycle parking, internal roads, services infrastructure, bin stores and bicycle stores.
- Footpath improvements along Standhouse Road.
- Landscaping, open spaces, play areas, boundary treatment and public lighting.
- All associated site works and services, at Ballymany, Newbridge, Co. Kildare.

The site has previously been used for gravel excavation and is currently in a state of gravel hardcore area. The total site area is 11.4ha. It forms part of a larger landholding and represents an extension to a previously permitted development at the southern end of the proposed development site. The initial phase of this development is currently under construction.

The proposed development site is located in a peri-urban area on the south-western outskirts of the town of Newbridge. Residential housing estates are located to the south, north and east of the proposed site whereas agricultural fields are located to the west. The regional R445 road which provides connectivity between Newbridge and the M7 motorway runs adjacent to the sites south-eastern boundary. The M7 motorway is at its closest to the site approximately 489m to the south of the site.

Panther Environmental Solutions Ltd (PES Ltd) was commissioned by Briargate Developments Newbridge Limited to complete the Noise and Vibration chapter for an EIAR in relation to the above proposed development.

This Noise and Vibration section includes:

1. Listing the baseline noise levels in the vicinity of the NSR's;

2. Predict the impact of the proposed development's construction and operational phases on the nearby sensitive receptors:
3. Recommend mitigation measures, as required

## 9.1 Competence & Expertise

Mr. Martin O'Looney has over seven years consultancy experience and has a BSc Degree in Environmental Science and Technology from Sligo Institute of Technology. Mr. Tom Madden has over three years consultancy experience and has a BSc Degree in Environmental Science from the University of Limerick.

## 9.2 Relevant Guidance and Legislation Documents

### *9.2.1 Noise Guidance and Legislation*

Planning and Development Act 2000 (S.I. No. 30 of 2000), as amended

Local authorities are responsible for the planning and environmental regulation of any proposed developments. The current planning and environmental regulatory framework require these developments to comply with the Planning and Development Act (2000) and related regulations.

The local authorities and An Bord Pleanála attach conditions relating to environmental management of these developments to planning permissions granted. Local authorities consider the land use and planning issues associated with the proposed developments in their County Development Plans.

The EPA Act (Noise) Regulations 1994 (S.I. No. 179 of 1994)

The relevant part of the Environmental Protection Agency Act 1992 dealing with noise is Part VI, Sections 106 to 108. These Sections deal with the control of noise, the power of local authorities to prevent or limit noise and the issue of noise as a nuisance.

The 1994 Regulations came into effect in July 1994 and outline the procedures for dealing with noise nuisance. The Regulations allow affected individuals, local authorities or the EPA to take action against an activity causing a noise nuisance.

These Regulations replaced the procedures for noise complaints contained in the Local Government (Planning & Development) Act 1963. Companies must show that reasonable care was taken to prevent or limit the noise from their activities. If the courts decide that a company is responsible for causing a noise nuisance, they can order the company to take measures to reduce, prevent or limit it.

EPA 'Guidance Note on Noise (NG4)' (2016)

The document relates primarily to noise surveys and assessments for EPA licensed facilities but in the absence of any other directly applicable guidance documents, it also is pertinent for the purposes of noise surveys and assessments accompanying planning applications.

It deals in general terms with the approach to be taken in the measurement and control of noise, and provides advice in relation to the settling of noise ELV's and compliance monitoring. In line with World Health Organisation (WHO) guidance, it recommends that the following noise levels not be exceeded at the facades of the nearest noise-sensitive receptors:

| Table 9.1: EPA NG4 Guidance Noise Limits | | | |
|---|---|---|---|
| **Period** | **Times** | **Standard dB(A)** | **Low Background Noise Area dB(A)** |
| Day | 07:00 - 19:00hrs | 55dB $L_{Ar,T}$ | 45dB $L_{Ar,T}$ |
| Evening | 19:00 - 23:00hrs | 50dB $L_{Ar,T}$ | 40dB $L_{Ar,T}$ |
| Night | 23:00 - 07:00hrs | 45dB $L_{Aeq,T}$ | 35dB $L_{Ar,T}$ |

**The National Roads Authority (TII formerly NRA) Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2004)**

The NRA's guidance document Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2004) is the recognised Irish guidance document for the assessment of road traffic noise.

This document has been referred to in the consideration of road traffic noise associated with the proposed development. The document also presents maximum permissible noise levels at dwelling facades during construction activities. This provides a useful reference for assessing construction noise of the proposed development.

| Table 9.2: The National Roads Authority (NRA) Guideline Construction Noise Limits | | | |
|---|---|---|---|
| **Period** | **Times** | **$L_{Aeq\ (1hr)}$ dB** | **$L_{pA\ (max)slow}$ dB** |
| Monday to Friday | 07:00 to 19:00hrs | 70 | 80 |
| Monday to Friday | 19:00 to 22:00hrs | 60 | 65 |
| Saturday | 08:00 to 16:30hrs | 65 | 75 |
| Sundays and Bank Holidays | 08:00 to 16:30hrs | 60 | 65 |

The Guidelines for the Treatment of Noise and Vibration in National Road Schemes (TII formerly NRA, 2004) was also considered in the preparation of the assessment. This document sets out noise and vibration limits for the construction phase which are generally applied by planning authorities to all construction projects.

BS5228:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise

There is currently no statutory guidance in Ireland relating to the maximum permissible noise level for a project's construction phase. Current guidance on permissible noise levels is therefore considered somewhat limited. In the absence of any statutory guidance or other specific limits prescribed by relevant authorities, an appropriate best practice measure has been adopted as the standard for this project.

Best practice guidelines are taken from the British Standard BS 5228 – 1: 2009 (+A1 2014): *'Code of Practice For Noise And Vibration Control On Construction And Open Sites – Noise'*. BS 5228 sets out an approach for setting appropriate construction noise limits for residential dwellings, but it does not provide guidance for commercial or office buildings.

The BS 5228 *'ABC Method'* calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded, indicates that a potential noise impact is associated with the construction activities.

**Table 9.3: Threshold of Potential Significant Effect**

| **Assessment category and threshold value period** | **Threshold value, in decibels (LAeq, T)** | | |
|---|---|---|---|
| | **Category A**[(a)] | **Category B**[(b)] | **Category C**[(c)] |
| Night-time (23.00−07.00) | 45 | 50 | 55 |
| Evenings and weekends[(d)] | 55 | 60 | 65 |
| Daytime (07.00−19.00) and Saturdays (07.00−13.00) | 65 | 70 | 75 |

NOTE 1: A potential significant effect is indicated if the LAeq, T noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.
NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total LAeq, T noise level for the period increases by more than 3 dB due to site noise.
NOTE 3: Applied to residential receptors only.

a) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
b) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
c) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
d) 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

### *9.2.2 Vibration Guidance and Legislation*

There is a very low likelihood of operational vibration impacts from the proposed development on account of its residential nature. The most likely potential vibration effects associated with the proposed development would be associated with the construction phase, during site clearing, excavation and levelling. Vibration threshold values discussed below are presented in the context of potential vibration effects from the construction phase.

Limits of transient vibration, above which cosmetic damage could occur, are given numerically in Table 9.4 (Ref: BS5228-2:2009). Minor damage is possible at vibration magnitudes which are greater than twice those given in Table 9.4, and major damage to a building structure can occur at values greater than four times the tabulated values (definitions of the damage categories are presented in BS7385-1:1990).

**Table 9.4: Transient Vibration Guide Values for Cosmetic Damage (Ref BS5228-2:2009)**

| **Type of Building** | **Peak Particle Velocity (PPV) (mm/s) in Frequency Range of Predominant Pulse** | |
|---|---|---|
| | 4 Hz to 15 Hz | 15 Hz and above |
| Reinforced or framed structures. Industrial and heavy commercial buildings. | 50 mm/s at 4 Hz and above | 50 mm/s at 4 Hz and above |
| Unreinforced or light framed structures. Residential or light commercial buildings. | 15 mm/s at 4 Hz increasing to 20 mm/S at 15 Hz | 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above |

*British Standard BS 7385 (1993) Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration* indicates that cosmetic damage should not occur to property if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz. These guidelines refer to relatively modern buildings and therefore, these values should be reduced to 50% or less for more sensitive buildings.

The human body is an excellent detector of vibration, which can become perceptible at levels which are substantially lower than those required to cause building damage. The human body is most sensitive to vibration in the vertical direction (foot to head). The effect of vibration on humans is guided by British Standard 6472:1992. This standard does not give guidance on the limit of perceptibility, but it is generally accepted that vibration becomes perceptible at levels of approximately 0.15 to 0.3 mm/s. buildings.

BS 6472 defines base curves, in terms of root mean square (rms) acceleration, which are used to assess continuous vibration. Table 5 of the Standard states that in residential buildings, the base curve should be multiplied by 9.4 at night and by 2 to 4 during the daytime to provide magnitudes at which the probability of adverse comment is low.

In order to assess human exposure to vibration, ideally, measurements need to be undertaken at the point at which the vibration enters the body, i.e. measurements would need to be taken inside properties. However, various conversion factors have been established to convert vibration levels measured at a foundation to levels inside buildings, depending on the structure of the building.

Vibration Dose Values (VDVs) is recommended in BS 6472 for the assessment of subjective response to vibration. The VDVs at which it is considered there will be a low probability of adverse comment are drawn from BS 6472 and presented in Table 9.5.

**Table 9.5: Threshold Values for the Evaluation of Disturbance due to Vibration**

| **Place** | **Daytime 16 Hr VDV ($ms^{-1.75}$)** | **Night-time 16 Hr VDV ($ms^{-1.75}$)** |
|---|---|---|
| Critical Working Area | 0.11 | 0.09 |
| Residential | 0.22-0.43 | 0.13 |
| Office | 0.43 | 0.36 |
| Workshops | 0.87 | 0.73 |

The NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2004) also includes a discussion of vibration levels in relation to construction activities. While the document relates to national road schemes, the advice on construction vibration is relevant to all construction activities. Table 9.6 includes allowable vibration levels during construction activities which would minimise the risk of building damage. This is the reference to be applied to the assessment of vibration in the Republic of Ireland.

**Table 9.6: Allowable Vibration During Construction in Order to Minimise the Risk of Building Damage**

| **Allowable Vibration Velocity (Peak Particle Velocity) at the Closest Part of Any Sensitive Property to the Source of Vibration, at a Frequency of** | | |
|---|---|---|
| Less than 10 Hz | 10 to 50 Hz | 50 to >=100 Hz |
| 8 mm/s | 12.5 mm/s | 20 mm/s |

## 9.3 Measurement Parameters

The parameters used to assess the noise are as follows:

**Leq(T):** The noise values recorded continuously at every instant during the t-minute sampling period are integrated by the noise metre to give a single value that represents the continuous equivalent sound level over the t-minute period during this survey.

**$L_{10}$ and $L_{90}$:** are both statistical noise levels. $L_{10}$ indicates that for 10% of the monitoring period the sound levels were greater than the quoted value. $L_{90}$ indicates that for 90% of the monitoring period, the sound levels were greater than the quoted value. $L_{10}$ is used to express event noise. $L_{90}$ is used to express background noise, usually filtering out loud and intermittent interferences such as traffic noise.

**Continuous:** noise produced without interruption.

**Intermittent:** noise that is punctuated with interruptions e.g. equipment operating in cycles or events such as single passing vehicle or aircraft.

**Impulsive:** a noise of short duration (typically less than one second), the sound pressure of which is significantly higher than the background; brief and abrupt.

**Tonal:** noise which contains a clearly audible tone i.e. a distinguishable, discrete or continuous note (whine, hiss, hum or screech etc).

For the purpose of this noise assessment, a tonal characteristic incurs a penalty of +5dB(A) in accordance with Section 4.3 of the EPA 2016 *Guidance Note for Noise in Relation to Scheduled Activities*.

In order for a tone or impulsive element to warrant a penalty, it should be clearly noticeable and audible. Situations in which a 5 dB penalty applies include the following:

- The noise contains a distinguishable, discrete continuous note (whine, hiss, screech, hum etc).
- The noise contains distinct impulses (bangs, clicks, clatters, or thumps).
- The noise is irregular enough to attract attention.
- The tonal components are clearly audible and the level in a 1/3rd octave band is greater than or equal to the following level in the two adjacent bands;
    - 15dB in low-frequency bands (25Hz to 125Hz);
    - 8dB in middle-frequency bands (160Hz to 400Hz), and;
    - 5dB in high-frequency bands (500Hz to 10,000Hz)

As per *'Tonal'* column in Table 8.3, *'NP'* indicates no penalty and *'P'* indicate a penalty for tonal noise.

The noise measurements were 'A' weighted (to equate to human ear hearing) and the time-weighting 'Fast' was applied.

**A-Weighted Decibels dB(A)**

Noise, in its simplest form can be described as unwanted sound. Sound is the result of a propagating disturbance through a physical medium i.e. sound wave. Through air, it is perceived by the ear as a pressure wave superimposed upon the ambient air pressure about the ear of the listener. When the medium is a fixed body, it is called vibration.

'A' Weighting is standard weighting of the audible frequencies designed to reflect the response of the human ear to noise. At low and high frequencies, the human ear is not very sensitive, but between 500 Hz and 6 kHz the ear is much more sensitive. In the A-weighted system, the decibel values of sounds at low frequencies are reduced compared with un-weighted decibels, in which no correction is made for audio frequency.

Sound level (Lp dB) and sound power ($L_W$ dB) are physical quantities which measure derivatives of the energy associated with a sound that can be measured by recording instruments.

Loudness is a psycho-physical subjective measure of the perceived response by the human auditory system to a sound. The loudness level of a sound is determined by adjusting a sound pressure level of a comparison pure tone of specified frequency until it is judged by normal hearing observers to be equal in loudness. Loudness level is expressed in phons.

In the mid-frequency range at sound pressures greater than approximately $2x10^{-3}$ Pa (40 dB re 20 µPa SPL), the following table summarises the average subjective perception of noise level changes.

**Table 9.7: WHO International: Fundamentals of Acoustics**

| Change in Sound Level (dB) | Change in Power | | Change in Apparent Loudness |
|---|---|---|---|
| | Decrease | Increase | |
| 3 | 1/2 | 2 | Just Perceptible |
| 5 | 1/3 | 3 | Clearly Noticeable |
| 10 | 1/10 | 10 | Half or Twice as Loud |
| 20 | 1/100 | 100 | Much Quieter or Louder |

As can be seen in the above table, an increase of 3 dB is double the sound power level; however, the change in loudness is just perceptible.

The term Leq is used to express the average noise level. It is measured in dB (A) and measured over a defined period of time. Specifically, it is the constant level equivalent to the same acoustic energy as a given event. The Leq is written as LAeq when it is measured with the A frequency weighting.

## 9.4 Study Methodology

This section has been prepared using the following methodology:

- A baseline Noise Survey was conducted within the proposed development site boundary to establish noise climate and the main sources of noise contributing to the existing environment. This Noise Survey was completed by Noel Tynan of Decibel Noise Control from 18:00pm on Wednesday 7th April to 16:55pm Sunday 11th April 2021.
- A review of the most relevant standards and guidelines has been undertaken for the project in order to identify appropriate noise criteria for the site,
- Noise calculations for the operational phase, as carried out by Noel Tynan of Decibel Noise Control, were done to guidance in conjunction with the Traffic Impact Assessment, have been assessed in general accordance with Noise Regulations and NG4 guidance issued by the EPA.
- A number of recommended noise and vibration mitigation measures have been proposed, where necessary, to ensure the proposed development does not result in any significant impact on its surrounding environment.

This report utilises the baseline noise data gathered by Noel Tynan of Decibel Noise Control, who carried out a baseline noise survey in April 2021. This survey was carried out from 18:00pm on Wednesday 7th April to 16:55pm Sunday 11th April 2021.

The instruments were set to measure and store noise samples of 5-minute duration and the stored samples were then transformed later to one hour as appropriate.

Using tripods, all measurements were taken at 3m above ground level. The two monitoring points were located within the boundary of the proposed development site

Baseline noise monitoring was carried out in general accordance with the EPA, 2016 '*Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities* (*NG4*)'.

The baseline environmental noise levels at L1 South and L2 North were determined by instrumented monitoring of existing noise levels. This was determined by taking broadband noise measurements at these two noise monitoring locations.

Two site locations were chosen for noise measurement, namely Location L1 South & L2 North. The latter being a short-term synchronised measurement with the instrument located at L1 south. The objective of the synchronised measurement being to identify any noise decay over the site whilst moving away from the identified primary noise source the M7 motorway. Locations L1 South & L2 North are shown in Figure 9.1 below.

The equipment used for the noise monitoring is as follows:
Location 1 – South: Sound Level Meter, Bruel & Kjaer Type: 2250L Serial No 3001350 Microphone, Bruel & Kjaer Type: 4189 Serial No 3022867. Calibration Certificate CDK 1908347dated 24/10/2019. Bruel & Kjaer outdoor microphone kit, type UA1404. Bruel & Kjaer Type AO 0409 Microphone extension cable.

Location 2 – North: Sound Level Meter, Bruel & Kjaer Type: 2270 Serial No 3001952. Microphone, Bruel & Kjaer Type: 4189Serial No 2819925. Calibration Certificate CDK 1937379 dated 09/08/2019. Calibrator, Bruel & Kjaer Type: 4231 Serial No 2460008. Calibration certificate No 04823/1 dated 26/10/2020. Bruel & Kjaer outdoor microphone kit, type UA1404. Bruel & Kjaer Type AO 0409 Microphone extension cable

Using the Type 4231 Sound Level Calibrator, that produces a sound level of 93.8dB re. 2x10-5 Pa, at a frequency of 1k Hz, both instruments used were calibrated before and after use to an accuracy of ± 0.3dB.

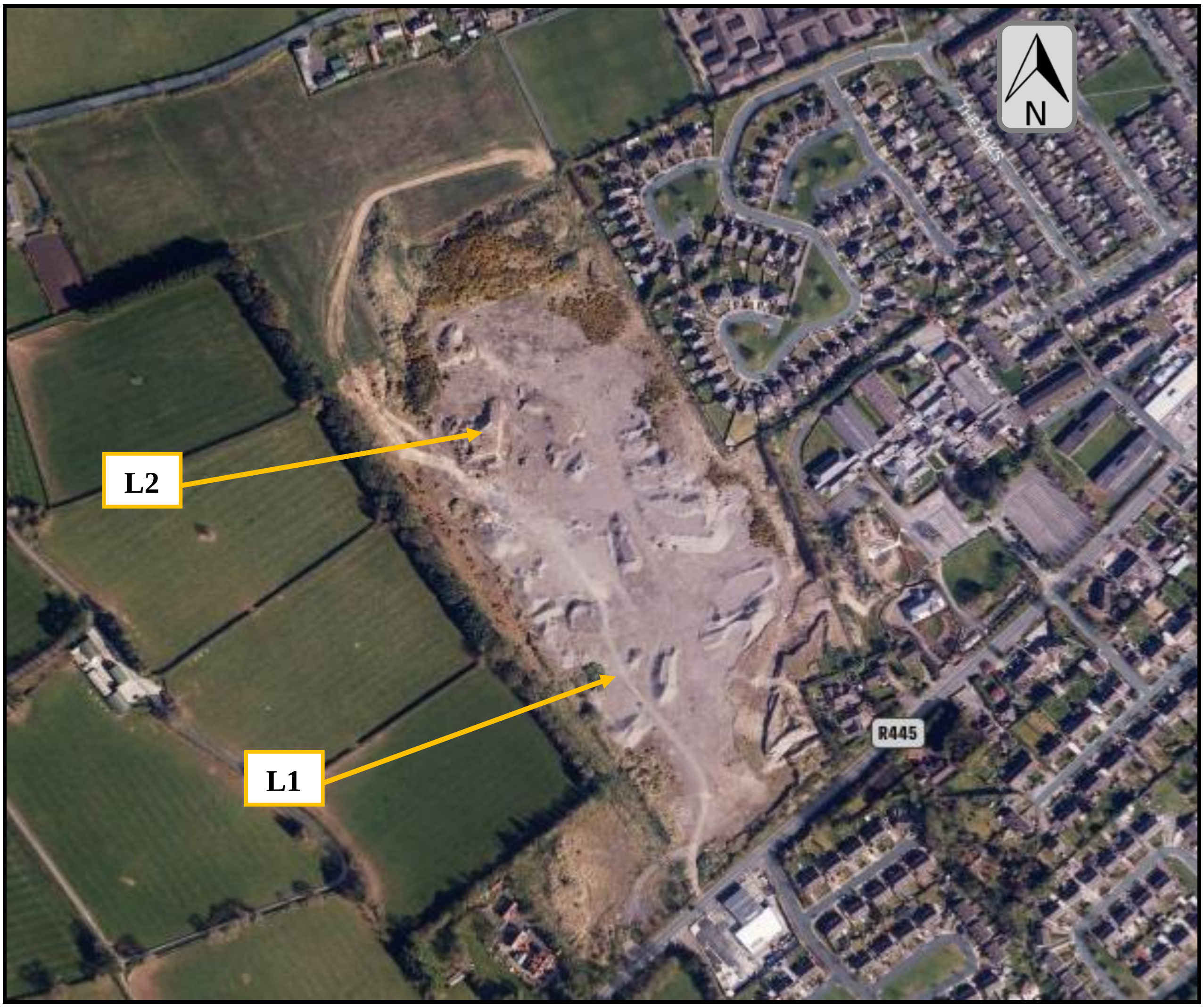


**Figure 9.1: Location of Noise Monitoring Points**

## 9.5 Noise Prediction Methodology

### ISO 9613-2:1996

The noise prediction methodology used in this report is based upon the international standard ISO 9613-2 "*Attenuation of Sound during Propagation Outdoors*".

This standard outlines a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources.

The central formula for this calculation is as follows:

$$A = A_{div} + A_{gr} + A_{bar} + A_{misc}$$

Where:

| | |
|---|---|
| A | is the attenuation due to site conditions |
| $A_{div}$ | is the attenuation due to the geometrical divergence (distance from source) |
| $A_{gr}$ | is the attenuation due to the ground effect |

$A_{bar}$ is the attenuation due to a barrier
$A_{misc}$ is the attenuation due to miscellaneous other effects as appropriate

This attenuation factor is then subtracted from the predicted noise of the proposed activity. The resultant figure is the predicted noise from the proposed activity at a given noise monitoring location.

This figure may then be added logarithmically to the existing background noise at the noise monitoring location to attain the predicted noise level if the proposed activity were to begin.

## 9.6 Relevant Formulae

In order to carry out this predictive analysis, the following attenuation characteristics have been taken into account:

### Divergence – $A_{div}$

The geometrical divergence accounts for the spherical spreading in the free field from the point sound source, causing attenuation due to the inverse square law. Divergence is calculated as follows:

$$A_{div} = 20.\text{Log}\left(\frac{\text{d}}{\text{do}}\right)$$

Where:
**d** is the distance from the source to the receiver (meters)
**$d_0$** is the reference distance

## 9.7 Noise Sensitive Receptors

Figure 9.2: Noise Sensitive Receptors Location Map

The following noise sensitive receptors which are closest to the proposed development site boundary in each cardinal direction were used for the predictive calculations:

**Table 9.8. Noise Sensitive Receptors**

| Ref. | Grid Ref | | Location Type | Location |
|---|---|---|---|---|
| | X | Y | | |
| **NSR1** | 278859 | 214243 | Noise Monitoring Location | Residential dwelling adjacent to sites northern boundary. |
| **NSR2** | 279105 | 214092 | | Residential property approx. 13.2m east of site boundary |
| **NSR3** | 279246 | 213762 | | Residential dwelling approx. 142m south of site boundary |
| **NSR4** | 279142 | 213644 | | Residential dwelling approx. 123.79m west of site boundary |

**Figure 9.3:** Address Point Map

## 9.8 Characteristics of the Proposed Development

The proposed development would comprise of the construction of a residential estate, with a variety of housing and apartment types and designs, and a childcare facility at Curragh Farm, Ballymany, Newbridge, Co. Kildare. Details of the proposed development works are as follows:

- Construction of 336 no. residential units consisting of 245 no. houses, 27 no. apartments and 64 no. duplexes.
- The 245 no. houses will comprise 2-storey, detached, semi-detached and terraced units to include: -
    - 17 no. 2-bed houses.
    - 184 no. 3-bed houses.
    - 44 no. 4-bed houses.
- The 27 no. apartments are located in a part 3-storey and part 4-storey building and include: -
    - 13 no. 1-bed units.
    - 13 no. 2-bed units.
    - 1 no. 3-bed unit.
- The 64 no. duplexes are located across 6 no. 2 to 3-storey buildings and include: -
    - 32 no. 1-bed units.
    - 16 no. 2-bed units.

  - 16 no. 3-bed units.
- A 2-storey creche.
- Car parking, bicycle parking, internal roads, services infrastructure, bin stores and bicycle stores.
- Footpath improvements along Standhouse Road.
- Landscaping, open spaces, play areas, boundary treatment and public lighting.
- All associated site works and services, at Ballymany, Newbridge, Co. Kildare.

The expected construction timeframe would be approximately five years over a phased basis, with hours of operation from 7.00am-19.00 Monday – Friday and 8.00-14.00 Saturday. No works would be carried out on Sundays and Bank Holidays.

During the construction phase, site clearance works would be undertaken, which would involve earth-moving activities and the removal of vegetation. Following site clearance works, construction of the residential dwellings and childcare facility would commence.

The foul drainage disposal strategy for the proposed development is to discharge all foul drainage to a proposed pumping station in the north-western corner of the site, which will be constructed as part of this development. The pumping station will in turn discharge flows through a rising main to an existing 225 mm diameter foul sewer on the R445 Ballymany Road to the southeast of the Site. The applicant intends to explore with Irish Water the feasibility of connecting the foul drainage discharge from the proposed development to the existing foul sewer network in Standhouse Road.

## 9.9 Baseline Noise Assessment - Results

The proposed development site is located at Ballymany, Newbridge, Co. Kildare. The main transport network located adjacent to the site is the regional R445 road, which is located along the sites south-eastern boundary. A residential housing estate along with an agricultural field and one-off residential dwellings are located along the sites north-eastern boundary. To the north the site is bound by a mixture of one-off residential dwellings and the L7037 Standhouse Road. Agricultural fields bound the site to the west. The M7 motorway is located approximately 489m to the south of the site.

The nearest sensitive receptors are residential properties located at The Elms housing estate, adjacent to the sites north-eastern boundary. Other nearby sensitive receptors are residential properties located along the south-eastern and northern boundaries of the proposed development site.

The existing noise environment is principally defined by traffic from the nearby M7 motorway, the R445 road, other local networks, seasonal agricultural activities and noise from the urban area of Newbridge town.

**Figure 9.4 – Proposed Site Location – Boundary in Red, Land Ownership in Blue**

Noise monitoring was carried out at the proposed development site from 18:00pm on Wednesday April 7th 2021 at 18:00 to Sunday April 11th 2021 at 16:55 by Noel Tynan of Decibel Noise Control

The noise monitoring locations are illustrated in Figure 9.2 above.

Associated particulars such as a description of the noise environment, dominant noise sources and any interferences/background noise recorded are also provided in this table.

The noise measurements attained during the monitoring period at location L1 South are displayed in Table 9.11 – 9.15 below.

### *9.9.1 Screening - Results*

#### *9.9.1.1 Quiet Area Screening*

The location of the development has been screened in order to determine if it is located in an area that could be considered a *'Quiet Area'* according to the EPA NG4 Guidance, which states:

*The location of the proposed development should be screened in order to determine if it is to be located in or near an area that could be considered a 'Quiet Area' in open country* *according to the Agency publication Environmental Quality Objectives - Noise in Quiet Areas.*

This is achieved using the following checklist:

**Table 9.9: Quiet Area Screening Checklist**

| Screening Question | Answer | |
|---|---|---|
| | Yes | No |
| Is the site >3km away from urban areas with a population >1,000 people? | | ✓ |
| Is the site >10km away from urban areas with a population >5,000 people? | | ✓ |
| Is the site >15km away from urban areas with a population >10,000 people? | | ✓ |
| Is the site >3km away from any local industry? | | ✓ |
| Is the site >10km away from any major industry centre? | | ✓ |
| Is the site >5km away from any national primary route? | ✓ | |
| Is the site >7.5km away from any motorway or dual carriageway? | | ✓ |
| **QUIET AREA?** | | ✓ |
| **Other Relevant Comments** | Newbridge Town (pop: 22,742): 1.5kmKm NE to Town centre.<br>Procter & Gamble: 743-m SW.<br>Newbridge Industrial Estate: 1.05-Km E<br>M7 Motorway: 490m S. | |

The proposed development location does not comply with all criteria, as per the checklist outlined above.

Therefore, it is considered that the development would not be located within a ‘*Quiet Area*’.

### *9.9.1.2 Areas of Low Background Noise Screening*

When an area is not identified as being *a ‘Quiet Area’*, the existing background noise levels measured during the environmental noise survey should be examined to determine if they satisfy the following criteria:

- Average Daytime Background Noise Level ≤ 40dB $L_{AF90}$
- Average Evening Background Noise Level ≤ 35dB $L_{AF90}$
- Average Night-time Background Noise Level ≤ 30dB $L_{AF90}$

**Table 9.10: Low Background Noise Screening Table - Daytime**

| Reference | LAeq dB(A) | $LA_{90}$ dB(A) |
|---|---|---|
| L1 - South | 54.8 | 47.4 |
| L2 - North | 49.1 | 47.4 |
| **Total Average** | **-** | **47.4** |

$\text{Average} = 10.\text{Log}\frac{1}{n}\sum_{i=1}^{n} 10^{L/10}$ When $L$ = Noise Level Recorded

Noise monitoring has indicated that the average daytime background $LA_{90}$ noise level of 47.4 dB is greater than the 40 dB daytime parameter outlined in Step 3, Chapter 4.4.2 of the EPA document *Guidance Note on Noise (NG4).*

Given the noise monitoring results obtained and the character of the area, it is likely that this area would not be considered a '*Low Background Noise Area*.

Noise Measurements from L1 (South)

**Table 9.11: Baseline Noise Assessment Summary Table April 7th/8th 2021.**

| **Start Time** | **LAeq (db)** | **LA$_{90}$(db)** | **LA$_{10}$(db)** | **LAfmax(db)** |
|---|---|---|---|---|
| 23:00 | 47 | 43 | 50 | 56 |
| 00:00 | 46 | 41 | 49 | 60 |
| 01:00 | 48 | 42 | 51 | 62 |
| 02:00 | 48 | 41 | 52 | 58 |
| 03:00 | 49 | 42 | 52 | 62 |
| 04:00 | 50 | 45 | 53 | 62 |
| 05:00 | 55 | 52 | 57 | 64 |
| 06:00 | 59 | 57 | 60 | 68 |
| 07:00 | 60 | 58 | 61 | 68 |
| 08:00 | 58 | 56 | 60 | 65 |
| 09:00 | 56 | 54 | 57 | 71 |
| 10:00 | 56 | 54 | 58 | 74 |
| 11:00 | 56 | 54 | 58 | 69 |
| 12:00 | 56 | 54 | 58 | 71 |
| 13:00 | 57 | 54 | 59 | 76 |
| 14:00 | 57 | 54 | 58 | 74 |
| 15:00 | 56 | 53 | 57 | 72 |
| 16:00 | 58 | 55 | 59 | 72 |
| 17:00 | 71 | 50 | 57 | 74 |
| 18:00 | 53 | 50 | 53 | 77 |
| 19:00 | 50 | 47 | 52 | 60 |
| 20:00 | 49 | 47 | 51 | 58 |
| 21:00 | 48 | 45 | 50 | 60 |
| 22:00 | 47 | 43 | 49 | 63 |
| 23:00 | 45 | 40 | 47 | 58 |

**Table 9.12: Baseline Noise Assessment Summary Table April 8th/ 9th 2021.**

| Start Time | LAeq(db) | LA$_{90}$(db) | LA$_{10}$(db) | LAfmax(db) |
|---|---|---|---|---|
| 23:00 | 45 | 40 | 47 | 58 |
| 00:00 | 42 | 29 | 46 | 63 |
| 01:00 | 31 | 28 | 32 | 49 |
| 02:00 | 36 | 29 | 40 | 49 |
| 03:00 | 39 | 33 | 42 | 50 |
| 04:00 | 43 | 38 | 45 | 53 |
| 05:00 | 46 | 43 | 48 | 55 |
| 06:00 | 48 | 46 | 49 | 60 |
| 07:00 | 49 | 46 | 50 | 68 |
| 08:00 | 48 | 41 | 47 | 69 |
| 09:00 | 56 | 37 | 61 | 78 |
| 10:00 | 49 | 37 | 51 | 76 |
| 11:00 | 54 | 43 | 54 | 78 |
| 12:00 | 63 | 45 | 60 | 97 |
| 13:00 | 56 | 46 | 61 | 74 |
| 14:00 | 60 | 47 | 63 | 76 |
| 15:00 | 66 | 53 | 66 | 92 |
| 16:00 | 52 | 48 | 54 | 67 |
| 17:00 | 51 | 49 | 52 | 63 |
| 18:00 | 50 | 48 | 52 | 63 |
| 19:00 | 49 | 46 | 51 | 57 |
| 20:00 | 48 | 45 | 50 | 57 |
| 21:00 | 45 | 42 | 48 | 55 |
| 22:00 | 43 | 39 | 46 | 58 |

**Table 9.13: Baseline Noise Assessment Summary Table April 9th/10th 2021.**

| Start Time | LAeq(db) | LA$_{90}$(db) | LA$_{10}$(db) | LAfmax(db) |
|---|---|---|---|---|
| 23:00 | 42 | 37 | 44 | 60 |

**Table 9.11: Baseline Noise Assessment Summary Table April 7th/8th 2021.**

| Start Time | LAeq (db) | $LA_{90}$(db) | $LA_{10}$(db) | LAfmax(db) |
|---|---|---|---|---|
| 00:00 | 41 | 34 | 44 | 59 |
| 01:00 | 39 | 33 | 42 | 52 |
| 02:00 | 37 | 31 | 40 | 52 |
| 03:00 | 38 | 32 | 41 | 53 |
| 04:00 | 40 | 33 | 42 | 55 |
| 05:00 | 43 | 36 | 46 | 69 |
| 06:00 | 44 | 39 | 47 | 61 |
| 07:00 | 44 | 40 | 47 | 65 |
| 08:00 | 46 | 41 | 46 | 76 |
| 09:00 | 44 | 40 | 46 | 63 |
| 10:00 | 44 | 40 | 46 | 63 |
| 11:00 | 44 | 41 | 46 | 60 |
| 12:00 | 44 | 41 | 46 | 62 |
| 13:00 | 44 | 41 | 46 | 63 |
| 14:00 | 43 | 40 | 45 | 67 |
| 15:00 | 46 | 41 | 48 | 63 |
| 16:00 | 46 | 41 | 48 | 63 |
| 17:00 | 49 | 46 | 50 | 66 |
| 18:00 | 46 | 42 | 48 | 61 |
| 19:00 | 44 | 40 | 46 | 56 |
| 20:00 | 43 | 39 | 46 | 59 |
| 21:00 | 44 | 39 | 46 | 56 |
| 22:00 | 43 | 38 | 46 | 59 |

**Table 9.14: Baseline Noise Assessment Summary Table April 10th/11th 2021.**

| Start Time | LAeq(db) | $LA_{90}$(db) | $LA_{10}$(db) | LAfmax(db) |
|---|---|---|---|---|

**Table 9.11: Baseline Noise Assessment Summary Table April 7th/8th 2021.**

| Start Time | LAeq (db) | $LA_{90}$(db) | $LA_{10}$(db) | LAfmax(db) |
|---|---|---|---|---|
| 23:00 | 41 | 37 | 44 | 54 |
| 00:00 | 39 | 34 | 42 | 55 |
| 01:00 | 37 | 32 | 40 | 49 |
| 02:00 | 37 | 32 | 39 | 56 |
| 03:00 | 38 | 33 | 40 | 50 |
| 04:00 | 41 | 36 | 44 | 64 |
| 05:00 | 42 | 39 | 45 | 59 |
| 06:00 | 43 | 39 | 45 | 59 |
| 07:00 | 42 | 39 | 45 | 61 |
| 08:00 | 42 | 38 | 44 | 62 |
| 09:00 | 43 | 39 | 45 | 66 |
| 10:00 | 44 | 41 | 47 | 67 |
| 11:00 | 46 | 41 | 46 | 79 |
| 12:00 | 45 | 41 | 46 | 66 |
| 13:00 | 46 | 43 | 48 | 72 |
| 14:00 | 45 | 42 | 47 | 64 |
| 15:00 | 47 | 44 | 49 | 59 |
| 16:00 | 49 | 46 | 50 | 66 |
| 17:00 | 46 | 42 | 48 | 61 |
| 18:00 | 44 | 40 | 46 | 56 |
| 19:00 | 43 | 39 | 46 | 59 |
| 20:00 | 44 | 39 | 46 | 56 |
| 21:00 | 43 | 38 | 46 | 59 |
| 22:00 | 41 | 37 | 44 | 54 |

The results of the survey from location L1 South are summarised as follows.

| **Table 9.15: Summary of Noise Survey Results at Location L1** | | | | | |
|---|---|---|---|---|---|
| **Start Time** | **Descriptor** | **April 7th / 8th** | **April 8th / 9th** | **April 9th / 10th** | **April 10th / 11th** |
| Over 24 hours. | $L_{den}$ | 61dB | 56 dB | 49 dB | 48 dB |
| 23:00 to 07:00 | $L_{night}$ | 53 dB | 43 dB | 41 dB | 40 dB |
| 23:00 to 07:00 | $LA_{eq}$ 8hr. | 50 dB | 41 dB | 40 dB | 39 dB |
| 07:00 to 23:00 | $LA_{eq}$ 16hr. | 55 dB | 52 dB | 44 dB | 44 dB |

The measurements recorded at monitoring location L2 North are tabulated below in comparison with those recorded at L1 South.

**Table 9.16: Baseline Noise Assessment LAeq noise levels across the site.**

| Start Time | L1 | L2 | L1 | L2 | L1 | L2 |
|---|---|---|---|---|---|---|
| | LAeq (db) | LAeq(db) | $LA_{90}$(db) | $LA_{90}$(db) | $LA_{10}$(db) | $LA_{10}$(db) |
| 18:10 | 54 | 50 | 52 | 49 | 55 | 52 |
| 18:15 | 54 | 51 | 52 | 49 | 56 | 52 |
| 18:20 | 55 | 52 | 53 | 51 | 56 | 53 |
| 18:25 | 54 | 51 | 53 | 49 | 56 | 52 |
| 18:30 | 53 | 50 | 52 | 49 | 55 | 51 |
| 18:35 | 53 | 49 | 51 | 47 | 54 | 51 |
| 18:40 | 50 | 46 | 49 | 45 | 52 | 48 |
| 18:45 | 51 | 48 | 49 | 44 | 53 | 50 |
| 18:50 | 51 | 48 | 50 | 46 | 53 | 49 |
| 18:55 | 52 | 48 | 50 | 47 | 53 | 50 |
| 19:00 | 52 | 48 | 50 | 46 | 53 | 49 |
| 19:05 | 53 | 48 | 50 | 46 | 54 | 50 |
| 19:10 | 51 | 47 | 50 | 46 | 53 | 49 |
| 19:15 | 51 | 47 | 50 | 45 | 53 | 48 |
| 19:20 | 51 | 49 | 49 | 45 | 53 | 49 |

## 9.10 Potential Impact of the Proposed Development

### *9.10.1 Construction Phase Noise*

The construction phase of the development would comprise site clearance works and development of the new residential developments and landscaping. Short-term noise impacts are likely to occur during the construction phase of the development due to the requirement to use heavy plant and machinery.

In order to complete a worst-case noise impact assessment of the programme above, it is necessary to determine what the noisiest stages of the construction phase will be. The simplest and most robust means of ensuring a worst-case scenario is assessed is to assume all items of plant/equipment are active at the same time. To ensure the most conservative approach, the assessment will also assume that all items of plant/equipment are active at the nearest boundary of the proposed development site to the relevant noise sensitive receptor.

Table 9.17 contains typical noise levels from various construction plant that will be used during the construction phase. These standard noise emission data will be used for the purposes of the worst-case noise assessment of the proposed works.

**Table 9.17: Noise Levels from Construction Plant (Ref: BS5228:2009)**

| Activity / Plant (Reference from Annex C & D, BS5228:2009) | Power Rating (kW) | Equipment Size, Weight (Mass), Capacity | Activity Equivalent Continuous Sound Pressure Level LAeq at 10m (dB) |
|---|---|---|---|
| Ground Excavation: Dozer (C2 - Ref 12) | 142 | 20t | 81 |
| Ground Excavation: Tracked excavator (C2 - Ref 14) | 226 | 40t | 79 |
| Ground Excavation: Wheeled loader (C2 - Ref 27) | 193 | - | 80 |
| Distribution of Material: Dump Truck (tipping fill) (C2 - Ref 30) | 306 | 29t | 79 |
| Distribution of Material: Dump Truck (empty) (C2 - Ref 31) | 306 | 29t | 87 |
| **Resultant Worst Case Noise Level** | | | **90** |

Based on the overall combined worst-case noise level from the proposed development site (i.e. 90dB[A] at 10m as per the above table), noise predictions have been undertaken to determine the worst-case predicted noise levels from the proposed development at a range of the nearest noise sensitive receptors.

Table 9.18 includes all worst-case predicted noise levels based on the distance from the nearest portion of the proposed site boundary of the main construction area to the relevant noise sensitive receptor.

**Table 9.18: Worst-Case Predicted Noise Levels from Construction Plant within the main construction area at Nearest Noise Sensitive Properties**

| Nearest Sensitive Receptors | | Worst - Case LAeq @ 10m (dBA) | Distance from Construction Boundary (m) | Distance Attenuation (dBA) | Predicted Worst-Case Construction Noise (dBA) |
|---|---|---|---|---|---|
| NSR1 | House near boundary along Standhouse Road (L7037) | 90 | 5 | 13.98 | 76.02 |
| NSR2 | House near eastern boundary of site | 90 | 13.9 | 22.86 | 67.14 |
| NSR3 | House at southern boundary of site, adjacent R445 road. | 90 | 142 | 43 | 47.0 |
| NSR4 | House to the west of site boundary, adjacent R44R road. | 90 | 123.79 | 41.85 | 48.15 |

$\text{Dist} = \sqrt{(Xr - Xs)^2 + (Yr - Ys)^2}$ when s = source & r = receptor

$A_{div} = 20.\text{Log}\left(\frac{d}{do}\right)$ when d = distance & $d_o$ = 1m

$LAeq = L_{(S)} - A_{div}$ when $L_{(s)}$ = source noise level

The table above illustrates that there is potential for worst-case construction noise levels of 76 dB(A) at a property (NSR1) in the vicinity of the proposed main construction area if mitigation measures are not put in place to control construction noise levels.

The proposed works would involve excavations near the site boundaries. These works would occur within distances ranging from 5 to 142 metres of residences. These works would result in predicted noise levels ranging from 47.0 dBA to 76.02 dBA whilst the highest noise activities are occurring.

However, these maximum noise levels would be limited to a few hours per day and would only occur during the initial ground preparation on each phase of the development. Each phase of the construction would also only occur for a few days in the immediate vicinity of individual noise sensitive receptors before moving to the next section of the site.

It must be borne in mind that the above predicted noise levels are very much a worst-case scenario and assume all activities are taking place simultaneously at the nearest point of the construction phase boundary to the relevant residential receptor.

It has been calculated that the minimum distance that worst-case construction works can take place within the vicinity of the noise sensitive receptors without the need for mitigation measures (i.e., The distance at which construction noise levels will be below the NRA Guidance Limits) is 10m to ensure compliance with the NRA Weekday limit of 70 dBA and 18m to ensure compliance with the NRA Saturday limit of 65 dBA

The predicted worst case scenario construction noise has been calculated to be in excess of the NRA Guidance Weekday limit of 70 dBA and Saturday limit of 65 dBA. Therefore, it is anticipated that there would be a moderate impact, for limited periods of time, on the closest local residences within the vicinity of the development during construction.

Mitigation measures would be required to reduce noise levels from construction activities to within guidance recommended levels.

### *9.10.2 Vibration*

There is potential for vibration impacts during the construction phase on account of the proximity of general construction activities to some of the nearest sensitive receptors and excavation works will be required as part of the construction works.

Minor short-term vibration impacts may occur during the construction phase as a result of the use of heavy plant and machinery; however, these impacts will be mitigated against by the fact that they are unlikely to propagate beyond the construction site boundary and the short term nature of works which may cause vibration in the vicinity of sensitive receptors. No significant vibration impacts would be expected to occur during excavations.

During construction, it will be necessary to consider the potential vibration impact associated with the construction phase activities at the nearest sensitive receptors. Control of the use of specific vibration generating plant in the vicinity of the site boundary closest to the nearest sensitive receptors would be required in order to ensure no significant impacts occur.

It is not anticipated that there will be any significant vibration impacts on nearby sensitive receptors during the operational phase due to the nature of the proposed development.

### *9.10.3 Cumulative Impacts*

The proposed development would result in additional traffic on the local road network during the operational phase. However, it is not anticipated that these traffic movements will be significant in terms of the existing traffic volumes within the area which are associated with existing residential developments, the M7 motorway and the town of Newbridge.

While further residential development would be likely to occur in the area, it is not considered that the proposed development would contribute significantly to the cumulative traffic noise impact.

### *9.10.4 'Worst Case' Scenario*

The worst-case scenario is that the development is not constructed as per the drawings and details provided in the planning application. While one would expect that the development is required to be constructed in accordance with the planning documents, which includes various mitigation measure outlined above, the worst-case scenario would be that the attributes and mitigation measure were not carries out and subsequently not appropriately enforced by the local authority.

The main potential for adverse impacts on the local noise environment will occur during the construction phase. The worst-case scenario, therefore, corresponds to the situation where the mitigation measures for construction activities fail or are not implemented. Should noise mitigation measures not be implemented during the construction phase, significant noise nuisance is likely in areas close to the construction site.

### *9.10.5 'Do Nothing' Impact*

If the proposed development were not to be established, there would be no impact on existing noise and vibration in the vicinity of the proposed site.

It should be noted that the construction phase of phase 1 of the project, which has previously been granted planning permission, is currently underway immediately adjacent to the proposed development site. Construction has been ongoing here and no issues have been reported to date in relation to noise or vibration impacts.

It is not anticipated that there will be any significant impacts on the local noise or vibration sensitive receptors or the local environment as a result of the Phase 1 development during the operational phase.

Any potential noise or vibration impacts are not anticipated to have a significant adverse effect on the local environment or receptors during the construction phase due to the comprehensive Construction Management Plan which has been compiled for this project and is currently being implemented at the site.

## 9.11 Avoidance, Remedial & Mitigation Measures

In order to sufficiently reduce the likely noise and vibration impact, a schedule of noise control measures has been formulated for the construction phase of the proposed development.

### *9.11.1 Construction Phase*

With regards to construction activities, reference is made to BS5228: Noise Controls on Construction and Open Sites, which contains detailed guidance on the control of noise and vibration from demolition and construction activities. The following is a list of mitigation measures, which should be adhered to during the construction phase:

- Limiting the hours during which site activities likely to create high levels of noise or vibration are permitted; Normal working hours will be 0800-1900 hours Monday to Friday and 0800-1400 hours on Saturdays. Sunday working will be avoided but may be necessary on some occasions. When working outside of normal hours is required the contractor will discuss such requirements with Kildare County Council.,
- Channels of communication between the developer, contractor, local authority and community should be established,
- A site representative responsible for matters relating to noise should be appointed,
- It is recommended that annual monitoring while critical construction operations are occurring is completed to ensure that guidance levels are not exceeded at nearby sensitive receptors as a result of construction activities from the proposed development.
- All on-site construction roads should be maintained to prevent banging and vibration noise from traffic,
- Plant with low inherent potential to generate noise and vibration will be used on-site,
- Activities with the potential to create noise should be scheduled so as not to be carried out simultaneously,
- Noise/acoustic barriers should be erected between noise sensitive location and noise sources.

### *9.11.2 Operational Phase*

It is not anticipated that there will be any adverse noise impacts on nearby sensitive receptors as a result of the operational phase of the proposed development, due to the nature of the activities which will be occurring there.

Residential housing estates, by their nature are typically low noise environments with the majority of noise emissions related to traffic movements within the estate. As all traffic within the boundaries of the proposed development will be subject to low speed limits which are commonly in place in such areas, it is not anticipated that this noise source will adversely affect the local noise environment or nearby noise sensitive receptors.

### *9.11.3 Vibration*

The vibration from construction activities will be limited to the values set out in section 1.1. It should be noted that these limits are not absolute but provide guidance as to magnitude of vibration that are likely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally likely to cause cosmetic damage, and construction work creating such magnitudes should proceed with caution. Where there is existing damage, these limits may need to be reduced by up to 50%.

It is not anticipated that there will be any vibration impacts on nearby sensitive receptors during the operational phase due to the nature of the development (residential housing estate).

Activities with the potential to create vibration should be scheduled so as not to be carried out simultaneously.

If works which have the potential to cause vibration impacts, must occur in the vicinity of sensitive receptors then care will be taken to ensure that the appropriate machinery is used. Using smaller excavators or lighter equipment would help reduce the likelihood of adverse vibration impacts affecting nearby sensitive receptors during the construction phase.

## 9.12 Monitoring

### *9.12.1 Construction Phase*

It is recommended that monthly noise monitoring be carried out along the boundary of the proposed site in order to monitor the effectiveness of noise management for the duration of the construction phase. Noise levels at noise sensitive locations should not exceed 70 dB(A) during weekdays and 65 dB(A) during Saturdays as per NRA guidance. These levels should not be exceeded, and any breach would require a review of operations. Noise mitigation measures should be put in place to ameliorate any exceedance which may be due to on-site construction work.

Should complaints arise, it is recommended that noise monitoring be carried out at sensitive receptors during the construction phase of the proposed development, to ensure guideline limits are not exceeded and to determine whether further mitigation measures are required.

Vibration measurements should be carried out where it is anticipated that guidance levels will be exceeded to ensure that no adverse effects occur to nearby sensitive receptors.

## 9.13 Assessment of Residual Impacts

Noise and vibration effects are transient in nature. For typical construction and residential noise sources, once noise and vibration sources cease or are suitably mitigated, there are no residual impacts.

Screening indicated that the proposed site location would not be considered an area of low background noise, as the average daytime $L_{90}$ was calculated to be 47.4 dB(A), which is above the 40 dB screening limit.

Noise monitoring has shown that the local noise environment would not have a significant impact on local sensitive receptors due to the nature of the development (residential housing). Traffic movements associated with activities at the development during the operational phase would be insignificant in comparison to existing traffic volumes on the nearby M7 motorway and within the town of Newbridge. Therefore, it is concluded that there would be **no significant residual noise impact** to noise sensitive receptors as a result of the operational phases of the proposed development.

It is not anticipated that there will be any significant vibration impacts on nearby sensitive receptors during the operational phase due to the nature of the proposed development.

No residual noise or vibration impacts are anticipated as a result of the proposed development.

## 9.14 Interactions

Noise generated during the construction and operational phases of the proposed development has the potential to impact upon human beings and fauna within the vicinity of the site.

During the construction phase, noise may be generated due to increased vehicle movements and the operation of construction plant. It is anticipated that there would be a moderate impact, for limited periods of time, on the nearest local residences and fauna within the vicinity of the development. Control and mitigation measures would be implemented to reduce noise and vibration, including measures relating to equipment operation and timing of activities. Given the transient nature of construction works, and provided mitigation measures are implemented, noise from construction would not be considered to pose a significant impact upon human beings or fauna.

The operational phase of the proposed development would result in increased traffic movements on the local road network. However, it is not anticipated that these traffic movements would have a significant impact on the existing noise levels in the area which are already heavily influenced by significant traffic movements on the nearby M7 motorway, the local road network and within the town of Newbridge.

## 9.15 Conclusions

As a result of this baseline noise survey and predictive analysis, it is anticipated that the proposed development would have no significant additional impact upon the existing noise environment of the area.

- Screening indicated that the proposed site location would not be considered an area of low background noise, as the average daytime $L_{90}$ was calculated to be 47.4 dB(A), which is above the 40 dB screening limit.

- There is potential for an adverse impact at a number of noise sensitive receptors adjacent to the sites northern and eastern boundaries during the construction phase.

- Predicted noise levels were determined to be 6 dB above the Daytime limit of 70 dB at the northern boundary and 2.14 dB above the Weekend limit at noise sensitive receptors along the eastern boundary.

- This potential impact would be mitigated by the short periods of time over which construction activities are likely to occur within close proximity to sensitive receptors and the carrying out of construction during normal working hours.

- Any potential impacts would be lessened further by the implementation of mitigation measures as outlined in section 9.10.1.

- It has been predicted that there would be no significant impact on noise levels at noise sensitive receptors to the south and west of the proposed development site during the construction phase.

- Predicted worst-case noise from on-site operations of the proposed development have been calculated to be 23 dB and 21.85 dB below the weekday limit of 70 dB at noise sensitive receptors to the south and west of the site.

- It is not anticipated that vibration impacts will occur at sensitive receptors as a result of the proposed development due to the limited time period over which excavation works would be occurring. Any vibration impacts that do occur will be short term and are unlikely to propagate beyond the site boundary.

- It is not predicted that operational noise levels would have a significant impact on local sensitive receptors due to the nature of the development (residential housing) and the fact that traffic movements associated with activities at the development during the operational phase would be insignificant in comparison to existing traffic volumes on the nearby M7 motorway and within the town of Newbridge.

- Therefore, it is concluded that there would be **no significant noise impact** to noise sensitive receptors as a result of the construction or operational phases of the proposed development.

## 9.16 Difficulties Encountered in Compiling

Every effort has been made to provide an accurate assessment of the situation pertaining to the site. However, predictive modelling can only give a quantitative estimate of future noise levels.

## 9.17 References

ISO 9613-2:1996. Attenuation of Sound during Propagation Outdoors.

Department of Transport (Welch Office) (1988), Calculation of Road Traffic Noise (CRTN)

EN BS 5228-1:2009 “Code of practice for noise and vibration control on construction and open sites”

National Roads Authority, (2004). Guidelines for the Treatment of Noise and Vibration in National Road Schemes”.

British Standard BS 7385 (1993) Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration

EPA “Guidance Note on Noise (NG4)” (2016)

BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting

UK Design Manual for Roads and Bridges [DMRB], Volume 11

UK Planning Policy Guidance Note 24 [PPG24] - Planning & Noise

# 10. LANDSCAPE & VISUAL IMPACT ASSESSMENT

## 10.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) has been prepared by Jane McCorkell Landscape Architect. The report provides an assessment of the landscape character and visual impact of the proposed development along with a description of the proposed mitigation measures.

The assessment should be read in conjunction with the photomontages prepared by GNet 3D in September 2020 (contained in Appendix 1) for the scheme, and the landscape report also prepared by Jane McCorkell Landscapes.

## 10.2 Study Methodology

This assessment is based on the following guidelines -:
The EPA Draft 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' (2017) and 'Draft Advice Notes for preparing Environmental Impact Statements' (2015)

The assessment involved -:

1 Visiting the site and the surrounding area
2 A review of statutory planning and other documentation to ascertain the local and wider significance
3 A study of ordnance survey mapping and aerial photography; a review of plans, sections and elevations of the proposed development and Part VIII Planning Scheme documentation.

Where appropriate and in accordance with the EPA Advice Notes and Guidelines the below table of terms are used to describe the degree, quality, and duration of an impact -:

| Impact Criteria | Description |
|---|---|
| Profound | An impact which obliterates sensitive characteristics |
| Significant | An impact which, by its character, magnitude, duration, or intensity alters a sensitive aspect of the environment |
| Moderate | An impact that alters the character of the environment in a manner that is consistent with the existing and emerging needs |
| Slight | An impact which causes noticeable changes in character of the environment without affecting its sensitivities |
| Imperceptible<br>consequences | An impact capable of measurement but without noticeable |

Terms relating to the duration of impacts as described in the EPA Guidelines are listed as follows:

| | |
|---|---|
| Momentary: | lasting seconds to minutes |
| Brief: | lasting up to one day |

| | |
|---|---|
| Temporary: | lasting up to one year |
| Short-term: | lasting one to seven years |
| Medium-term: | lasting seven to fifteen years |
| Long-term: | lasting fifteen to sixty years |
| Permanent: | lasting over sixty years |

### *10.2.1 References*

- Kildare County Council Development Plan 2017—2023
- Environmental Protection Agency, (2017) Draft Guidelines on the information to be contained in Environmental impact Assessment Reports
- Environmental Protection Agency, (2015) Draft Advice Notes for preparing Environmental Impact Statements
- Landscape Institute (UK) and Institute for Environmental Management & Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition.

### *10.2.3 Nature of Impacts*

Impacts on the landscape arise in two distinct but closely related aspects. The first impact is on the character of the landscape arising from the insertion of new development or the alteration of elements within an existing context. The second is visual impact, which arises because of changes or insertions within a view. The impact on the view depends on the degree and nature of the change and such changes may rise from either ‘visual intrusion’ (i.e., alteration without appreciable blocking) or ‘visual obstruction’ (i.e., alteration with a notable extent or full blocking).

It is recognised that as with all landscape and visual considerations, impacts will be influenced and informed, to some degree, by subjective perceptions of how the overall change(s) matter to any given individual.

The assessment of landscape and visual impacts includes:

- Direct impacts upon specific landscape elements within and adjacent to the site
- Effects of the overall pattern of the landscape elements which give rise to the character of the site and its surroundings
- Impacts upon any special interests in and around the site
- Direct impacts of the scheme upon views and
- Overall impact on landscape character and visual amenity

## 10.3 Existing Receiving Environment

### *10.3.1 Site Location & Landscape Context*

The proposed development at Ballymany is positioned between the rapidly expanding urban & residential lands of Newbridge Town and surrounding rural farmland. The area is within the Newbridge local area plan boundary and zoned as New residential land in the local zoning objective plans.

The Site fronts onto the R445 Ballymany road to the South, close to Junction 12 off the M7 motorway. The Eastern boundary of the development borders largely residential properties, Scoil Mhuire and its associated lands, along with the Keadeen Hotel, Spa, and leisure centre.

The Northern boundary is formed along Standhouse Road and includes a road embankment and several single house dwellings. Further north of this road is the Dublin to Limerick Railway line, and the Special Conservation Area known as Pollardstown Fen.

The Western boundary adjoins Ballymany stud farm, with an existing Hedgerow of approximately 490m formed by large mature Oak with understory of Hawthorn and Bramble. The hedgerow provides screening to the surrounding landscape and existing dwellings on this rural fringe. The Natural Heritage Area ‘The Curragh’ lies further to the west of Ballymany Stud.

The area is serviced well with a 1.3km distance from the entrance at Standhouse Road to Newbridge town centre and 1.2km distance from the Ballymany road entrance to the town centre. The link road granted under phase 1 will provide residents with a link to both routes. The M7 Motorway is less than 1km distance from the south entrance and this provides a direct link to Irelands main motor network routes.

The existing landscape character has altered from undulating agricultural grassland to a sand and gravel extraction quarry in the last 10 years. The urban fringe character from the east dominates the views from the boundaries into the adjoining school, playing fields and residential developments. Views to the town centre are diminished due to the expanse of adjacent residential areas.

The southern boundary is defined by the R445 link road from the M7 motorway to the Newbridge Town Centre. This roadway starts at the southwestern point of the proposed development and marks the outer edge of the Newbridge town boundary. The north, west and southwestern landscape character is defined by large fields, which is in keeping with the agricultural practices of the areas. The views are rolling hills and large farm holdings.

The subject landscape is in the Southwestern Area Newbridge. Within the Kildare County Development Plan 2017 – 2023 the lands are characterised as central undulating lands of low sensitivity, that being ‘*Areas with the capacity to generally accommodate a wide range of uses without significant adverse effects on appearance or character of the area’*.

**Figure 10.1: OSI Map 2012 (left) and 2013-2018 (right)**

### *10.3.2 Landscape Planning Context*

The planning context and requirements for the area of the proposed development are set by the current Kildare County Development Plan (2017 – 2023) and the Newbridge Local Area Plan 2013 – 2019. In relation to landscape amenity and green Infrastructure the proposed development cites the following characteristics of the subject proposal as being fully consistent with the relevant policies and objectives of the Kildare County Development Plan:

- The landscape strategy approach minimises the intervention of existing boundary trees and wildlife corridor to the west. The approach has been to utilise this natural boundary as a buffer between the existing farm landscapes and the proposed link road from south to north (*GI 8: Contribute towards the protection of and manage the existing networks of woodlands, trees and hedgerows which are of amenity or biodiversity value and /or contribute to landscape character, and to strengthen local networks*)
- The landscape approach has aimed to work with the natural undulation of the site and use these landscape characteristics in the design approach to create usable and distinct open spaces within the development (*LA 2: Protect and enhance the county's landscape by ensuring that development retains and protects and, where necessary enhances the appearance and character of the existing local landscape*).

Under the Newbridge Local Area Plan 2013-2019 the lands are zoned as 'New Residential' with a movement objective to create a link road that will connect the R445 and Standhouse Road.

Phase 1 of the development granted under planning reference Ref. 16/658 (ABP-249038), is currently under construction

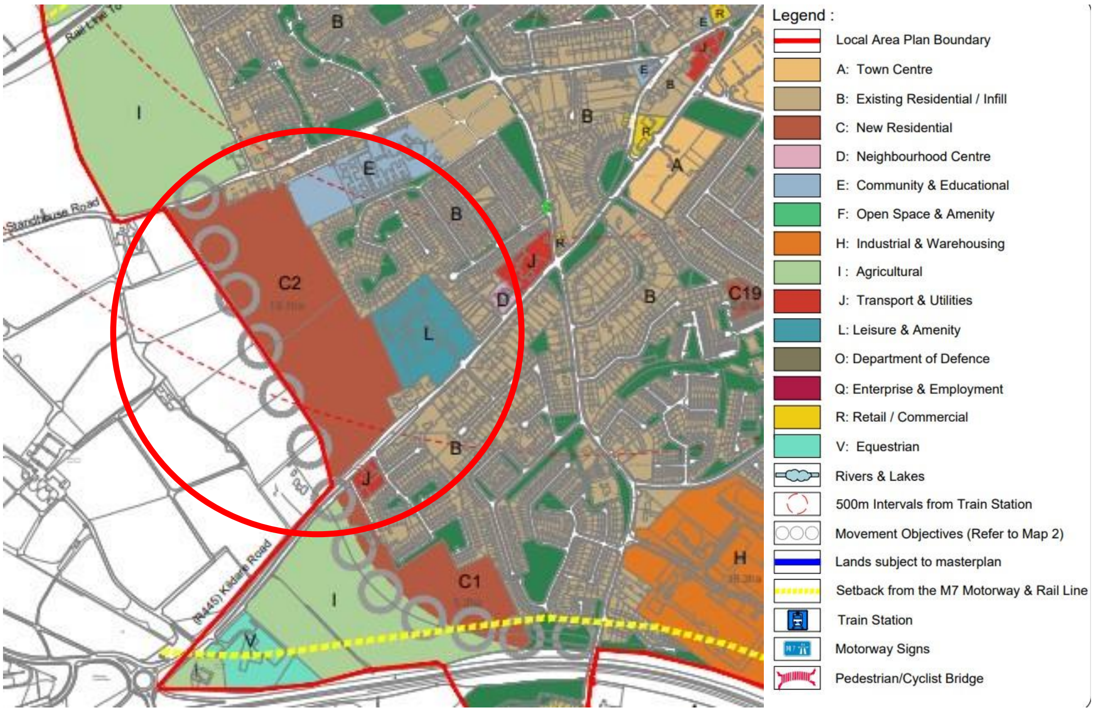


**Figure 10.2: Newbridge Local Area Plan 2013 - 2019 Map 7 Land Use Zoning Objective**

## 10.4 Characteristics of the Proposed Development

A detailed description of the proposed development is included in Chapter 2 of the EIAR. Please refer to all associated drawings for layouts and sections included with this application.

A summary of the main elements of the proposed residential development with creche, served by a Link Road will consist of the following:

- Construction of 336 no. residential units consisting of 245 no. houses, 27 no. apartments and 64 no. duplexes;
    - The 245 no. houses will comprise 2-storey, detached, semi-detached and terraced units to include: -
        - 17 no. 2-bed houses;
        - 184 no. 3-bed houses;
        - 44 no. 4-bed houses;
    - The 27 no. apartments are located in a part 3-storey and part 4-storey building and include: -
        - 13 no. 1-bed units;
        - 13 no. 2-bed units;
        - 1 no. 3-bed units;
    - The 64 no. duplexes are located across 6 no. 2 to 3-storey buildings and include: -
        - 32 no. 1-bed units;
        - 16 no. 2-bed units;
        - 16 no. 3-bed units;

- A 2-storey creche.
- Car parking, bicycle parking, internal roads, services infrastructure, bin stores and bicycle stores;
- Footpath improvements along Standhouse Road.
- Landscaping, play areas, boundary treatment and public lighting.

All associated site works and services.

### 10.4.1 *Key Receptors*

For a view to be impacted there needs to be a viewer. Views are experienced from locations such as residential areas, recognised routes and popular vantage points. Receptors are the viewers from these points and have been included in this assessment. The degree that a receptor experiences the impact will depend on several factors, including:

- Receptor activity; leisure, recreation, sport, travelling or working
- Receptor movement: static or moving and for how long are they exposed to change
- The significance of the location
- The extent of the route or area of change
- Whether the receptor is exposed to the change daily, frequently, occasionally, or rarely
- Orientation of receptors, are views open or intermittent
- Proportion of development that is exposed
- Viewing direction and distance
- Accessibility to viewpoint
- Nature of change and nature & receptor

The value of a view can be determined by the following definitions:

| | |
|---|---|
| High | Nationally recognised view, no detracting elements. |
| Medium | Regionally or locally recognised view, (or unrecognised) pleasing and well composed with few detracting elements. |
| Low | Typical or poorly composed view often with numerous detracting elements. |

The visual susceptibility of visual receptors can be classified as follows

| | |
|---|---|
| High | View is of primary importance and likely to notice even minor changes. |
| Medium | View is important but not the primary focus and tolerant of some change |
| Low | View is incidental or unimportant and tolerant of a high degree of change |

### *Northern Receptors*

The view from the single house dwellings on the Standhouse Road to the proposed site arise mainly due to the low compact hedgerow along the boundary. The landscape topography at this point is comparatively level to the surrounding dwellings

The existing view to the development site at this time from these locations could be classified as low, and the susceptibility to there being an impact from change is medium.

This rating is largely due to the extraction of sand and gravel from the site. Topsoil is stored in large mounds, and views are curtailed in some locations

Views into the site for passing traffic along the roadway are minimal due to the embankment and narrow width of the existing carriageway. The retention of the existing hedgerow along the Standhouse Road is not viable due to the insertion of the proposed link road. The value of the existing view from the carriageway is low, with the impact from the insertion of the proposed link road high.

### *Eastern Receptors*

The views into the site from this boundary are from ‘The Elms’ residential area. These properties are at a higher elevation to the current site levels and will overlook the proposed development. The existing boundary walls will provide screening from the dwellings in this area.

The view to the development site from these locations could be classified as low, and the susceptibility to there being an impact from change is low.

Views arising from Scoil Mhuire and the associated playing fields are low in value due poor boundary treatment. However, as the topography of the area is generally level the inclusion of buffer planting will not be negative and will improve the view and microenvironment of the playing fields.

### *Southern Receptors*

The views to the site from this location are experienced if travelling along the R445 or from the single dwellings on the road [and future dwellings that are proposed on the opposite side of the road – same view impact as existing dwellings looking at Phase 1]. Views directly into the site from the R445 are obscured at present due to the Phase 1 development currently under construction on this site. The long-term impact will not be negative as the site has been used for the extraction of sand and gravel, with topsoil stored in large mounds. The view to the development site from the road location could be classified as low, and the susceptibility to there being an impact from change is high.

The views from the dwellings at the south easterly corner are limited due to the visual screening to the rear of these properties. The single farm holding to the southwest of the proposed boundary is positioned at a lower level and largely screened from the development by the existing mature boundary of deciduous and evergreen trees.

The view to the development site from these locations could be classified as low, and the susceptibility to there being an impact from change is high.

***Western Receptors***

The lands to the west are mainly grassland and grazing lands with managed hedgerows. The existing buffer of mature specimen trees and hedgerow that run along this boundary offer a natural visual screen and division between the rural landscape and the outer urban fringe boundary of Newbridge.

There are no views impacted from the designated landscape area of the Curragh due to the surrounding landscape character of undulating topography and the intervening pastoral landscape and existing field boundaries of trees and hedgerows.

The view to the development site from these locations could be classified as low, and the susceptibility to there being an impact from change is low.

### *10.4.2 'Do Nothing' Scenario*

The most likely 'do nothing' scenario would be the implementation of the permitted development in full. For clarification refer to the existing planning (ref: 16/658). The permitted development is of similar building scale and would therefore have a similar impact.

## 10.5 Potential impact of the proposed development

All development works have some potential for landscape character and visual impact. These potential impacts are significantly mitigated by the nature of the proposals, and compatibility with the existing landscape and its surrounding character: avoidance of interference with mature trees and minimise interference with boundary treatments. Nevertheless, the scheme does have a potential impact on the surrounding landscape character and visual impacts.

The following potential visual effects, direct and indirect landscape effects, as well as the duration and nature of the effects arising from the proposed developments have been identified. Photomontages 1 – 11 in appendix 1, illustrate the proposed development from viewpoint locations within the area. A description of each photomontage is in included in section 9.6.2

### *10.5.1 Effects at Construction*

Effects arising from the process of construction are of similar nature to those arising from the decommissioning process and are therefore not considered separately. Generally, construction effects will be temporary, short-term effects which occur during the construction phase only. Areas experiencing visual effects during this phase vary considerably depending on the active construction phase.

The site entrance will be located on the R445 Road, with the initial works including the construction of the site compound, access road, and carpark. The site entrance is likely to affect the traffic on the R445 Road, including heavy and light vehicles travelling to and from the development. The existing vegetative buffers along the southern boundaries will provide a degree of screening between the site and the receptors, thus minimising the construction impact.

Landscape and visual effects during the construction stage will be experienced in the vicinity of the development site, from locations with views of the proposed development site and along the roads where construction traffic will travel. Site clearance, earthworks, construction compound, construction works, and associated machinery will be visible from the southern and western boundaries, and the elevated viewpoint of the north Strandhouse Road. Due to the movements of construction staff and equipment, it may be more noticeable to a receptor in comparison to a relatively static site operation.

The landscape and visual effects and their significance at construction phase will be temporary, adverse and range from minor to moderate in the wider study area, and moderate to major in the areas with proximity of the proposed developments site boundaries.

### *10.5.2 Effects at Operation*

Given the sand and gravel quarry replaced an agricultural landscape it is considered that the potential for landscape and visual impact during the operational stage is both permanent and moderate.

The residual effects arising from the development following implementation and establishment of the proposed mitigation measures will result in:

- Potential effects of the development as a landscape resource and character, including the perceptual qualities of the landscape.
- Potential effects of the development on views and the visual amenity of the area, include the likelihood of the development to alter the composition of views in the surrounding area; and

- Potential cumulative effects of the development in combination with other planned and proposed developments of similar scale upon the landscape and visual resource of the surrounding area.

While the nature of the development is in line with the emerging needs of the area, the buildings will be visible from the adjoining lands, including adjoining residential, the R445 & Standhouse Road.

### *10.5.3 Avoidance, Remedial and Mitigation Measures*

The purpose of the identified mitigation measures is to avoid, reduce and where possible offset any significant adverse direct or indirect effects on the environment arising from the proposed development. The principal mitigation for the proposed development is inherent in the design of its architecture, public realm, and open space, which has evolved through an interactive process of assessment and consultation between the multi-disciplinary design team.

The proposed mitigation measures have been developed through a landscape masterplan and with a Green Infrastructure Strategy in mind to ensure greater connectivity between all landscape elements in the surround area.

### *10.5.4 Avoidance Measures*

- Retention and protection of existing mature vegetation where possible on the western boundary. Existing trees to be retained and protected during construction stage in accordance with recommendation form the Arboriculture Assessment.
- Unsafe trees and hedgerow to be removed to allow for development and installation of proposed link road, greenway/ cycle path under the direction of the arborist.
- Avoidance of condense development and overshadowing by buildings on surrounding landscape features.

### *10.5.5 Reduction Measures*

The building site and its associated compound, scaffolding and security fencing will be visible during construction. This is temporary, and unavoidable in all circumstances. Mitigation at this stage is primarily through site management procedures, such as:

- Vehicles exiting the site during construction stage shall be subject to wheel wash facilities or road sweepers shall be used to maintain clean roads.
- Any lighting used during construction process should be kept to a minimum, providing for site safety only, and shall be directed into the site and away from adjacent residential properties and roads.

- Disturbance of existing vegetation will be minimised where possible. Proposed planting will help integrate the proposed development into the surrounding landscape, providing screening where needed, reflect vegetation patterns of local habitats, and minimise the effect on the landscape character of the area.

### *10.5.6 Remediation Measures*

- Enhancement of site tree cover by introduction of additional tree and woodland planting.
- Provide a permeable design by creating connections to other amenities, such as the proposed link road and its associated pedestrian/ cycle path.
- Landscape works to be carried out as per associated landscape layout.
- Appropriate new native species to be used throughout the scheme
- Landscape management and maintenance to be drawn up and approved by qualified professional.
- Ensure that all ongoing landscape maintenance and debris cleaning is carried out during the operational period within the site: and
- Ensure that ongoing maintenance and replacement of failing or failed plant material.

The review of photomontages allowed for the assessment of how effective the proposed mitigation will be regarding residual landscape and visual effects arising from the development.

The aim of the proposed landscape mitigation measures is to minimise the visual effects on identified receptor within the study area, in particular residential receptors. The landscape mitigation aims to compliment the space by adding new landscape elements helping to integrate the proposed development into its existing environs over time. The overarching design intention is to propose dynamic open space and interactive landscape designed to engage a new community.

## 10.6 Potential Residual Landscape and Visual Effects

With the completion of the construction works and the implementation of the proposed landscape mitigation measures, the development will become a long-term feature of the Ballymany and Newbridge area.

Effective execution and establishment of the proposed landscape mitigation/ green infrastructure will have a positive impact and help to ‘Soften’ landscape and visual effects associated with the proposed development considerably, particularly for residential areas located near the proposed development. In the medium to long term, the perception of adverse landscape and visual effects will reduce in tandem with the maturing of the proposed planting.

### *10.6.1 Residual Landscape Effects*

Long term residual landscape effects will arise from the change in landscape character from rural to suburban, and subsequent alterations to existing landscape patterns and vegetation of the site. The proposed development will alter significantly and permanently the landscape character within the proposed development and in available views particularly for the agricultural areas to the west of the site. The change in landscape character will be prominent but not totally uncharacteristic when seen in conjunction with large areas of suburban landscape spread across the Newbridge areas adjacent to the proposed development. Identified adverse landscape effects at close distance will reduce, in tandem with the maturing of the proposed vegetation, helping to integrate the proposal into its environs.

Intervening built structures will screen the proposed development from many locations within the wider study area. The change in landscape character will be experienced mainly from the elevated location to the north and south link road from the R445 to Standhouse Road. The residual change in landscape effects will not vary greatly from the time when the development is completed because of distance. The greening of planting areas, along with the retained vegetation will develop, mature, and further integrate the proposed development to the rural/ urban fringe the site borders.

### *10.6.2 Cumulative Impacts*

With the combined impact of the permitted development on the southern side of the R445 and phase 1 of the existing permitted development on the site (operational stage), the cumulative impacts are in line with what is acceptable in accordance with Newbridge development plan.

### *10.6.3 Environmental Interactions*

Long term environmental interactions from the development shall include the following

- Population and human health & wellbeing; incorporation of transport green infrastructure toa the landscape through cycle paths and engaging greenspace open opportunities for users to engage with landscape and its many health benefits.
- Biodiversity; By retaining the existing hedgerow the rural fringe and wildlife corridor is protected and utilise for both existing habitats and potential expansion through native planting in the proposed open spaces
- Civil and Green infrastructure; with a coordinated approach the civil requirements of the site have an interaction on human movement, water run off and biodiversity.

### *10.6.2 Viewpoints/ Photomontage Descriptions*

11 No. Photomontages (Refer to Appendix 1) have been prepared to illustrate the visual & physical character of the proposed residential development within the surrounding landscape.

All views have been taken from publicly accessible places where a visual impact can arise.

The CGI's have been prepared around the site to demonstrate the appearance of the buildings and proposed landscape. Description of visual impact is highlighted in the below table:

| Photomontage 1 | View from R445 towards Newbridge |
|---|---|
| Existing View | The easterly view at the entrance to the site is obscured by existing vegetation and offers partial views to the existing sand and gravel extraction mounds. |
| Proposed View | The proposed view shows the two-story homes which shall run along the link road |
| Impact (Construction) | Moderate negative short term visual impact |
| Impact (Operation) | Moderate neutral long term visual impact |

| Photomontage 2 | View from R445 towards the M7 Motorway interchange |
|---|---|
| Existing View | The westerly view along the southern boundary is obscured by existing banked road verge and vegetation |
| Proposed View | The proposed development is obscured by the existing landscape features |
| Impact (Construction) | Moderate negative short term visual impact |
| Impact (Operation) | Imperceptible neutral long term visual impact |

| Photomontage 3 | View from Keadeen Hotel Car park |
|---|---|
| Existing View | The elevated position of the hotel and its existing landscaped bank and mature vegetation obscure all views into the site |
| Proposed View | The proposed development is not visible from the hotel |
| Impact (Construction) | Imperceptible negative short term visual impact |
| Impact (Operation) | Imperceptible neutral long term visual impact |

| Photomontage 4 | View from The Elms |
|---|---|
| Existing View | The view westerly from the residential development to the site are open due to the nature of the existing boundary treatments of the Elms. |
| Proposed View | The proposed view demonstrates the two storey properties with existing landscape boundary planting between |

| | |
|---|---|
| Impact (Construction) | Moderate negative short term visual impact |
| Impact (Operation) | Moderate neutral long term visual impact |

| Photomontage 5 | View from Standhouse Road |
|---|---|
| Existing View | The view is along the northern boundary at the edge of the site. Views from this section of the road are obscured by vegetation on the embankment |
| Proposed View | The proposed new link road significantly alters the view into the landscape due to the change in the built environment and infrastructure. The entrance road detailing, the tree planting and green space along the link road will help to soften the potential impact and generally improve the quality of the view. |
| Impact (Construction) | Significant negative short term visual impact |
| Impact (Operation) | Moderate positive permanent visual impact |

| Photomontage 6 | View from Standhouse Road |
|---|---|
| Existing View | The view is easterly towards Newbridge. |
| Proposed View | The proposed development will be imperceptible from this viewpoint |
| Impact (Construction) | Imperceptible negative short term visual impact |
| Impact (Operation) | Imperceptible neutral long term visual impact |

| Photomontage 7 | View from the Curragh Racetrack roundabout |
|---|---|
| Existing View | The view north easterly towards the site is obscured by existing mature vegetation |
| Proposed View | The proposed development will be imperceptible from this viewpoint |
| Impact (Construction) | Imperceptible neutral short term visual impact |
| Impact (Operation) | Imperceptible neutral long term visual impact |

| Photomontage 8 | View from the Curragh Racetrack roundabout |
|---|---|
| Existing View | The view easterly towards the site is obscured by existing mature vegetation |
| Proposed View | The proposed development will be imperceptible from this viewpoint |
| Impact (Construction) | Imperceptible neutral short term visual impact |
| Impact (Operation) | Imperceptible neutral long term visual impact |

| Photomontage 9 | View from Irish Rail Bridge at Morristownbiller |
|---|---|
| Existing View | The view south easterly towards the site is obscured by existing mature vegetation |
| Proposed View | The proposed development will be imperceptible from this viewpoint |
| Impact (Construction) | Imperceptible neutral short term visual impact |
| Impact (Operation) | Imperceptible neutral long term visual impact |

| Photomontage 10 | View from Irish Rail Bridge at Allen View Heights |
|---|---|
| Existing View | The view southerly towards the site is obscured by existing roadway verge and mature vegetation |
| Proposed View | The proposed development will be imperceptible from this viewpoint |
| Impact (Construction) | Imperceptible neutral short term visual impact |
| Impact (Operation) | Imperceptible neutral long term visual impact |

| Photomontage 11 | View from Junction 12 M7 Motorway interchange |
|---|---|
| Existing View | The view north easterly towards the site is obscured by existing dense mature vegetation |
| Proposed View | The proposed development will be imperceptible from this viewpoint |
| Impact (Construction) | Imperceptible neutral short term visual impact |
| Impact (Operation) | Imperceptible neutral long term visual impact |

## 10.7 Conclusion

The predicted negative impacts of this development shall primarily occur at construction phase, when the lands will be transformed from a sand and gravel extraction site into a residential area. The existing residential developments to the east, and the sites proximity to Newbridge provides a context for the positioning of this development into the existing landscape. The green fields to the west provide a natural buffer to the Curragh. The existing vegetation along the western boundary provide effective screening, and therefore the negative visual impacts are restricted to the residential areas to the east, and the access points for the new link road from the R445 to Standhouse road. The mitigating factors, including the retention of the boundary trees and hedgerow, and the additional landscape works being provided shall positively impact the landscape character of Ballymany and the surrounding connecting areas. It is considered the proposed development is in accordance with Kildare County Councils development plan objectives, specifically in relation to 'Green Infrastructure'.

## Appendix 10.1 Photomontages

Proposed photomontage locations for 11 views

View 1 - Existing view from R445 towards Newbridge.

View 1 – Proposed view from R445 towards Newbridge.

View 2 - Existing view from R445 towards the M7 Motorway interchange.

View 2 – Proposed view from R445 towards the M7 Motorway interchange.

View 3 - Existing view from Keadeen Hotel carpark.

View 3 - Proposed view from Keadeen Hotel carpark.

View 4 - Existing view from The Elms

View 4 - Proposed view from The Elms

View 5 - Existing view from Strandhouse Road.

View 5 - Proposed view from Strandhouse Road.

View 6 - Existing view from Strandhouse Road.

View 6 - Proposed view from Strandhouse Road.

.

View 7 - Existing view from Curragh Racetrack Roundabout

View 7 - Proposed view from Curragh Racetrack Roundabout

View 8 - Existing view from Curragh Racetrack

View 8 - Proposed view from Curragh Racetrack

View 9 - Existing view from Irish Rail Bridge at Morristownbiller.

View 9 - Proposed view from Irish Rail Bridge at Morristownbiller.

View 9 - Existing view from Irish Rail Bridge at Allen View Heights

View 9 - Proposed view from Irish Rail Bridge at Allen View Heights

View 9 - Existing view from Junction 12 M7 Motorway interchange

View 9 - Proposed view from Junction 12 M7 Motorway interchange

# 11. CULTURAL HERITAGE

## 11.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) has been prepared by Martin Byrne of Byrne Mullins & Associates, Archaeological and Historical Heritage Consultants.

Cultural Heritage is defined by UNESCO as “the legacy of physical artefacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations” (www.unesco.org/new/en/cairo/culture/tangible-cultural-heritage).

The Heritage Act (1995) contains a list of various aspects of heritage, including archaeological monuments and objects, architectural heritage, fauna, flora, geology, heritage gardens and parks, heritage objects, inland waterways, landscapes, monuments, seascapes, wildlife habitats, and wrecks.

In terms of the present project, Cultural Heritage is assumed to include all humanly created features on the landscape, including portable artefacts, which might reflect the prehistoric, historic, architectural, engineering and/or social history of the area.

## 11.2 Methodology

The Cultural Heritage components of the study comprise the results of a survey and evaluation of selected sites of archaeological and architectural heritage architectural potential within, and in the immediate environs of, the proposed development area. The work general consists of the results of a paper survey and field inspection. In addition, in terms of Archaeological Heritage, the results of a previous programme of general intrusive Archaeological Testing undertaken within the overall landholding was reviewed (Section 10.6.4); in addition, a further specific programme of Archaeological Testing was also undertaken (Section 11.6.5 & Appendix 11.2).

### *11.2.1 Definition of Study Area*

The overall proposed development lands and an area of approx. 500m surrounding such lands were determined to be the Study Area for Cultural Heritage. The extent of the Study Area was chosen to reflect an appropriate Cultural Heritage context for the development, beyond which it was considered that a development of this nature would have no direct/indirect (visual) impacts.

### *11.2.2 Paper Survey*

As part of a documentary/cartographic search, the following principal sources were examined from which a list of sites and areas of Archaeological Heritage interest/potential was compiled:

- Record of Monuments and Places – Co. Kildare (RMP)
- Sites and Monuments Record of the Archaeological Survey of Ireland (SMR) – www.archaeology.ie
- Topographical Files of the National Museum of Ireland
- Annual Archaeological Excavations Bulletin – www.excavations.ie
- Heritage Council Heritage Maps & Data – www.heritagemaps.ie
- Historic maps and Aerial Photographic Archive of Ordnance Survey Ireland (OSI) – www.osi.ie
- National Inventory of Architectural Heritage – Survey of the Architectural Heritage of County Kildare (NIAH) – www.buildingsofireland.ie
- Documentary and cartographic sources (see Appendix 10.1)
- Kildare County Development Plan 2017-2023 (KCDP)
- Newbridge Local Area Plan 2013-2019 (NLAP)

### *11.2.3 Field Inspection*

Detailed field surveys/inspections were undertaken in early May 2020 and August 2020. These included a surface reconnaissance of the subject site and inspections of the surrounding lands, where possible, together with inspections of exposed soil layers along the edges of sections of the site and on the site surface.

An attempt was also made to identify previously unrecorded sites of built heritage potential within, and in the immediate environs of, the proposed development area.

## 11.3 Site Location & Description

The overall landholding is located on the southwestern fringe of Newbridge Town – Figure 11.1. The site is roughly rectangular in configuration and has frontage onto two roads. The southern boundary is largely defined by the R445 the main route running south-westwards from the town centre to Junction 12 of the M7 motorway. The northern boundary of the site has frontage onto Standhouse Road an arterial route serving western areas of the town and which further to the east towards the town centre has a junction with the R445.

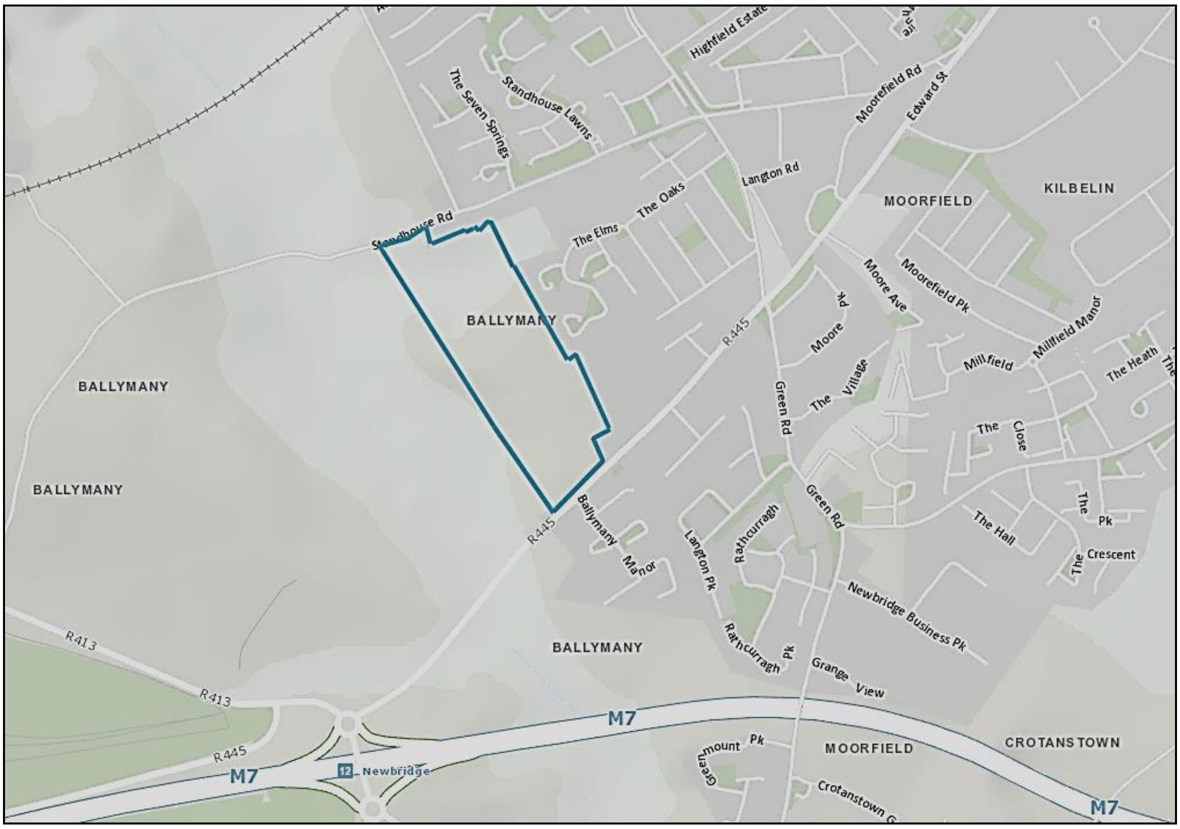


**Figure 11.1 Overall Landholding**

Parts of the overall eastern boundary of the site adjoin existing residential development the Elms which has rear gardens adjoining the common boundary. The site also has limited boundaries with existing residential development which also have frontage onto the R445 and Standhouse Road. The remaining boundaries adjoin the Keadeen Hotel along the southern section of the eastern boundary south of the Elms residential development and a national school to the north of the Elms development. There is an embankment along this boundary with a discernible difference in level between higher lands to the east and the subject site. The western boundary adjoins agricultural lands and has a mature hedgerow and trees along the boundary. The overall landholding comprises an area of 15.12 hectares, with the subject application area comprising 11.4ha. The land is not level with an overall fall in level from the southeast to the north west but there is great variation in levels arising from previous extractive workings on the site (see Figure 11.2). The site currently has a number of gravel stockpiles, particularly in the central eastern area of the site, and in this and the southern area the original ground levels have been reduced into geological derived sands and gravels; the northern area is under rough grass and is relatively undisturbed except for a number of soil mounds and surface rutting. There is also an overhead electricity line running north south in the western area of the site.

An aerial view of the overall site, as existing, is illustrated in Plate 11.1, with a selection of views shown in Plates 11.2 – 11.8.

Plate 11.1 Aerial View of Overall Site – as existing

Plate 11.2 Southernmost Area of Site – from south

Plate 11.3 General View of southern & central area of site – from south

Plate 11.4 General View of southern and central eastern areas of site – from south

Plate 11.5 General View of central western area of site – from southeast

Plate 11.6 Exposed Soil Layers following significant ground reductions – southern site area

Plate 11.7 General View of northern site area from south

Plate 11.8 General View of north-eastern site area from central southwest

The southernmost area of the overall site is currently being developed for residential use, including new entrance, internal access roads, residential plots and new link-road along the western site boundary to Standhouse Road, as illustrated in Figure 11.2; such development is being undertaken as part of a previous Grant of Planning (KCC Ref: 16/658; ABP Ref: PL09.2490380) for the overall lands. The extent (red-line boundary) of the present application with respect to the overall landholding is indicated in Figure 11.2.

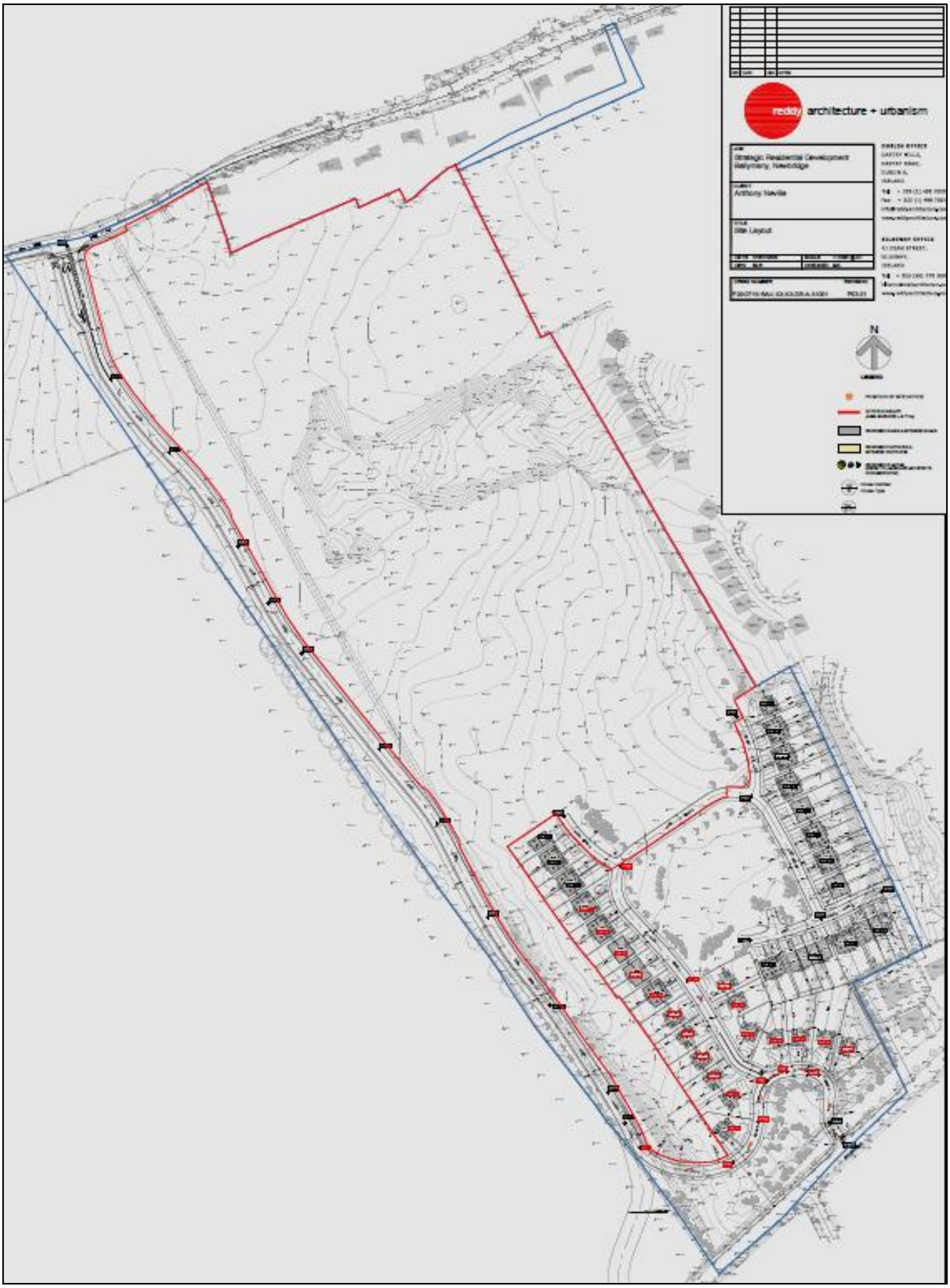


Figure 11.2 Extent of Subject Application (red-line boundary) with respect to overall landholding

## 11.4 Description of Development

The development proposes the construction of 336 no. residential units, comprising 245 no. two storey houses, 27 no apartments, within one building and 64 no. duplex units arranged in 6 no. 2 & 3 storey buildings. A childcare facility (616sqm) is also proposed as a stand-alone 2 storey building to serve the development. The proposed development also includes the provision of car parking spaces and bicycle parking spaces; internal roads; services infrastructure including foul and surface water drainage; bin and bicycle storage facilities; public open space; play areas; boundary treatments; landscaping and public lighting; together with all associated and ancillary site and development works.

The overall layout plan of the development, as proposed, is illustrated in Figure 11.3.

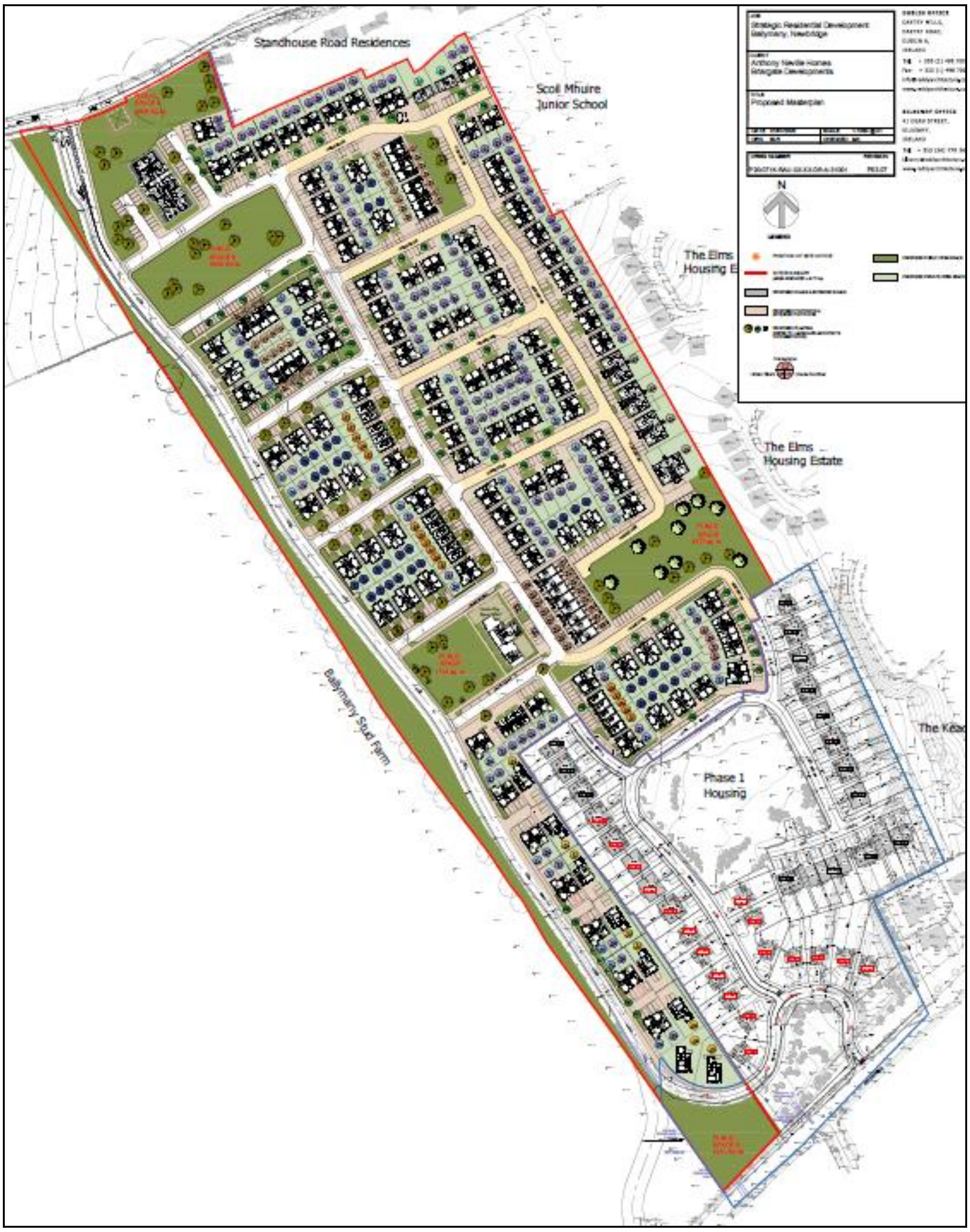


Figure 11.3 Proposed Layout Plan

## 11.5 General Historical Background

The subject site is located in the townland and civil parish of Ballymany and on the barony of Offaly East (O.S. 6-inch map; Kildare Sheet 23).

Prior to the Anglo-Norman invasions, the general region of the proposed development formed part of the territories of the *Uí Faelain*, with the *Uí Dúnlainge* as their overlords. The ownership of the region, including Dún Ailinne (near Kilcullen), Kildare (town) and *Cuirrech Life* (Curragh Plains), in the eight century reflects how politically important the area was both in secular and religious terms. Dún Ailinne was symbolic of the ancestral lineage of the overlordship of Leinster, while Cell Dara (Kildare) was one of the principal houses of Leinster. Furthermore, on the northern edge of the region lay the Hill of Almu (Almain/Hill of Allen), the residence of the mythical figure Fionn Mac Cumaill, who overcame the god Nuada and became ruler of the otherworld. Consequently, the Curragh and immediate environs was situated at the junction of the economic arteries of the province and also at the point of intersection of the mythical, ancestral and religious spheres of the Laigin culture.

Following the Anglo-Norman invasions, the lands at Kildare and the surrounding region was granted to Meiler FitzHenry, a grandson of Henry I, while Maurice Fitzgerald was awarded lands at the Curragh, including the present Ballymany. .

With the introduction of the 'parish system' during the medieval period, the subject lands were included in the parish of Ballymany. The present townland of Ballymany formed part of this former parish. According to the Connolly (2001, 17) a list of ancient churches in the Diocese, drawn up in the seventeenth century by the bishop of Kildare, Dr. Roche MacGeoghegan, includes *Capella de Ballemanny*. There are a number of possibilities for the origin of the name of Ballymany, including *Baile Meadhonach* – 'middle town;' *Baile Mháine* – 'Maine's town' or possibly *Baile na Manaigh* – 'town of the monks' (Placenames Commission – www.logainm.ie). The latter does not necessarily mean that there was a monastery there but that the lands may have been owned by a monastery, probably Great Connell, and worked by lay tenants.

The censuses of 1641 and 1670 record that townland of Ballymany formed part of the estates of George Fitzgerald, earl of Kildare; although the Fitzgeralds were Catholic, the Civil Survey (aka Down Survey) of 1656-8 describes the townland as 'Protestant Land' (www.downsurvey.tcd.ie). The Civil Survey map (Figure 11.4) does not indicate any structures (e.g., church or castle) within the parish of Ballymany.

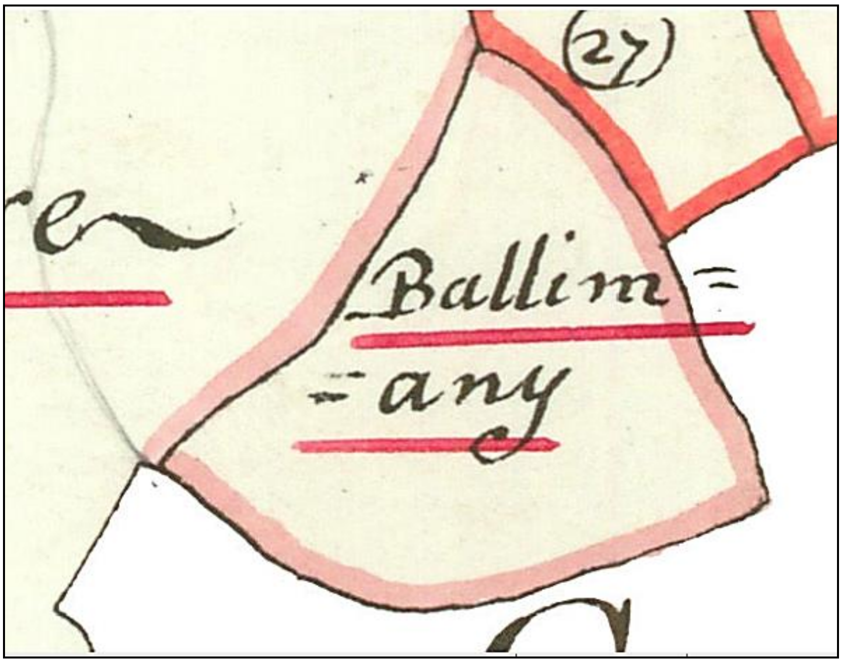


**Figure 11.4 Extract from Civil Survey Map of 1656-8 indicating the extent of Ballymany Parish**

According MacLysaght (1969, 355), the area was called ‘Balliminnie’ in the later seventeenth century and described as being ‘a small village of poor cabins and an old castle’. Fr. James Eustace was listed as the parish priest of Ballymany in 1704 (Connolly, 2001, 34) but in *c.* 1731 the Vicar of Naas reported that Ballymany was the only parish of his union where mass was not constantly celebrated (*ibid.* 38).

Very little is recorded about the area in the eighteenth century, with most historical events relating to the nearby Curragh Plains and associated with horse-racing and military proceedings. Noble & Keenan’s map of 1752 (Figure 11.5) names ‘Ballymanny’, with the Standhouse Road and the present R445 road established by this time; it also indicates a large house to the east. Taylor’s map of 1783 (Figure 10.6; *A Map of the County of Kildare*) indicates the site of a church (Section 10.6.2; SMR: KD023-020) to the south of the Curragh Road (present R445), with hillocks situated on either side of this road; it also indicated that the environs of the subject site was formally planted with trees.

**Figure 11.5 Extract from Noble & Keenan – 1752**

**Figure 11.6 Extract from Taylor - 1783**

Ballymany is described by Lewis (1837) as “a parish, partly in the barony of South Naas, and partly in that of East Ophaly, county of Kildare, and province of Leinster, 4 miles (E) from Kildare, on the road to Naas; containing 185 inhabitants. It is a rectory, in the diocese of Kildare, and is part of the union of Killishy; the tithes amount to £36. 18.5 In the R.C. divisions it forms part of the union or district of Newbridge.” The Ordnance Survey map of this time (Figure 11.7) indicates that the site incorporated a number of field divisions and that the centre of the Standhouse Road acted as a townland, civil parish boundary and barony boundary; structures are indicated immediately outside the north-eastern and north-western extents of the northern boundary, with a further structure located outside western side of the south-western boundary; some tree planting is illustrated along the southern boundary and along a section of the western boundary and a possible quarry pit is shown inside the eastern extent of the southern third of the site.

Griffith’s Valuation (*Primary Valuation of Ireland 1848-64*) of 1854 notes that the entire development site formed part of the estates of George Burdett and part of a landholding leased by James Flanagan.

The Ordnance Survey map of 1939 (Figure 11.8) indicates some minor changes to the field divisions within the site; the planting along the southern boundary is not shown but that along the western boundary has been extended; the possible quarry pit within the site is not shown, but one is shown on the northern side of Standhouse Road; more structures are indicated in the environs of the site, and the field divisions to the west, including a section of the western site boundary, have been supplemented with drainage ditches.

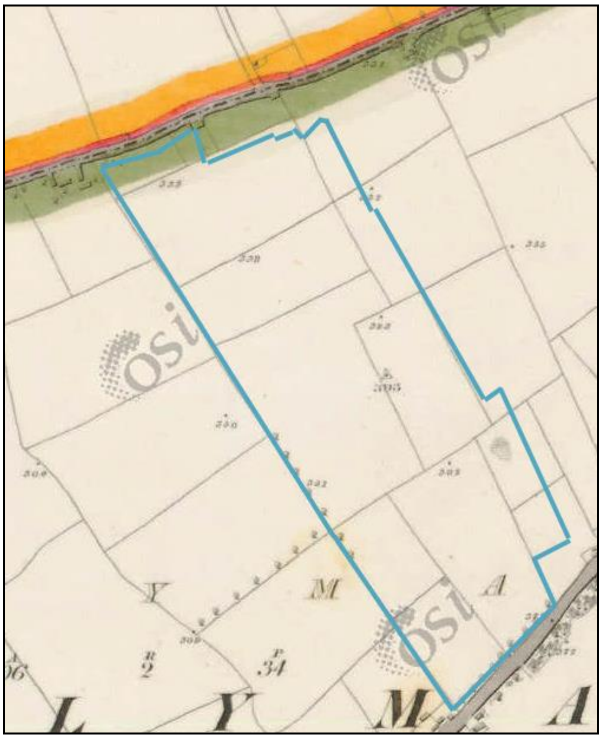


Figure 11.7 Extract from O.S. Map of 1837

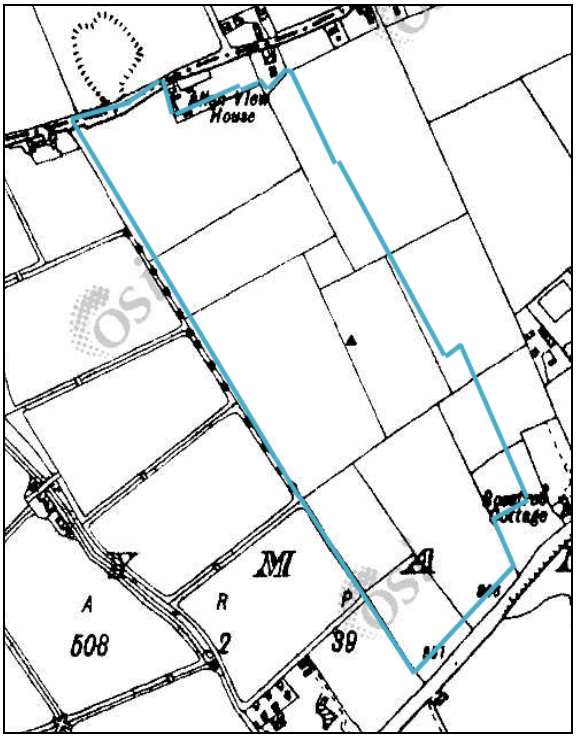


Figure 11.8 Extract from O.S. Map of 1939

The lands remained in agricultural use until more recent years, which the southern two thirds (approximately) were subject to sand & gravel extraction.

## 11.6 Archaeological Heritage

Archaeology is the study of past societies through their material remains and the landscapes they lived in. “The archaeological heritage consists of such material remains (whether in the form of sites and monuments or artefacts in the sense of moveable objects) and environmental evidence” (DoAHG 1999, p9).

Archaeological heritage comprises all material remains of past societies, with the potential to enhance our understanding of such societies. It includes the remains of features such as settlements, burials, ships and boats and portable objects of all kinds, from the everyday to the very special. It also includes evidence of the environment in which those societies lived. The terms “site” or “monument” are used generally to refer to fixed structures or areas of activity, as opposed to particular moveable objects. Historic wrecks are also part of the archaeological heritage (DHLG&H, 2021, 3).

### *11.6.1 Statutory Protections*

The statutory and administrative framework of development control in zone of archaeological potential or in proximity to recorded monuments has two main elements:

(a) Archaeological preservation and licensing under the National Monuments Acts and

(b) Development plans and planning applications under the Planning Acts.

#### *11.6.1.1 National Monuments Acts*

Section 12 (1) of the National Monuments (Amendment) Act, 1994 provides that the Minister for the Environment, Heritage and Local Government shall establish and maintain a record of monuments and places where the Minister believes there are monuments, such record to be comprised of a list of monuments and relevant places and a map or maps showing each monument and relevant place in respect to each county of the State. This is referred to as the 'Record of Monuments and Places' (RMP), and monuments entered into it are referred to as 'Recorded Monuments.'

Section 12(3) of the National Monuments (Amendment) Act 1994 provides for the protection of monuments and places in the record, stating that
"*When the owner or occupier (not being the Minister) of a monument or place which has been recorded under subsection (1) of this section or any person proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such monument or place, he shall give notice in writing of his proposal to carry out the work to the Minister and shall not, except in the case of urgent necessity and with the consent of the Minister, commence work for a period of two months after having given the notice.*

#### *11.6.1.2 Kildare County Development Plan 2017 – 2023*

The following relevant Archaeological Heritage Objectives are set out in Section 12.9.1 of the Plan:

| | |
|---|---|
| **AH1** | Manage development in a manner that protects and conserves the archaeological heritage of the county, avoids adverse impacts on sites, monuments, features or objects of significant historical or archaeological interest and secures the preservation in-situ or by record of all sites and features of historical and archaeological interest. The Council will favour preservation in – situ in accordance with the recommendation of the Framework and Principals for the Protection of Archaeological Heritage (1999) or any superseding national policy. |
| **AH2** | Have regard to the Record of Monuments and Places (RMP), the Urban Archaeological Survey and archaeological sites identified subsequent to the publication of the RMP when assessing planning applications for development. No development shall be permitted in the vicinity of a recorded feature, where it detracts from the setting of the feature, or which is injurious to its cultural or educational value. |
| **AH3** | Secure the preservation (in-situ or by record) of all sites, monuments and features of significant |

| | |
|---|---|
| | historical or archaeological interest, included in the Record of Monuments and Places and their settings, in accordance with the recommendations of the Framework and Principles for the Protection of Archaeological Heritage, DAHG (1999), or any superseding national policy document |
| **AH4** | Ensure that development in the vicinity of a site of archaeological interest is not detrimental to the character of the archaeological site or its setting by reason of its location, scale, bulk or detailing and to ensure that such proposed developments are subject to an archaeological assessment. Such an assessment will seek to ensure that the development can be sited and designed in such a way as to avoid impacting on archaeological heritage that is of significant interest including previously unknown sites, features and objects. |

#### *11.6.1.3 Newbridge Local Area Plan 2013-2019*

The following relevant Archaeological Heritage Policies are set out in Section 7.11.2 of the Plan:

| | |
|---|---|
| **AH 7** | It is the policy of the Council to require an appropriate archaeological assessment to be carried out by a licensed archaeologist in respect of any proposed development likely to have an impact on a Recorded Monument or its setting |

**NOTE:** The RMP for County Kildare was published in 1996 Any archaeological monuments and sites discovered since the publication are not subject to protections under the National Monuments Acts, unless specifically the subject of a Preservation order, but are protected in the Kildare County Development Plan under Policy AH2 above.

### *11.6.2 Archaeological Inventory*

There are no previously recorded monuments located within, or in the immediate environs of the subject development lands. No surface features of archaeological potential were noted by cartographic or aerial photographic research undertaken with respect to the production of this report or by the subjacent surface reconnaissance survey of the subject lands, the latter of which included an examination of exposed soil surfaces.

There are Recorded Monuments located within the wider defined study area. These are a Mound (SMR: KD023-019) and a Church – possible (SMR: KD023-020), both located in the townland of Ballymany and at distances of approximately 350m and 500m, respectively, from the southern site boundary. The locations of these monuments with respect to the subject development site are illustrated in Figure 11.9 and they are described as follows:

**KD023-019**
**Class**: Mound
**Townland**: BALLYMANY
**Description**: Near the bottom of an E-facing pasture slope which forms the E side of a narrow N-S valley. A fairly poorly preserved, almost circular earthen mound (base diams. 49.7m N-S; 47m E-W; surface diams. 23.3m N-S; 20m E-W), highest at W (H 2.9m) and lowest at E and N (H 1.8m). The edges of the mound have been scalloped by small areas of quarrying and there is a lot of nettle growth in the

NE sector. Possibly a natural hillock which has been artificially scarped (Source: www.archaeology.ie; Date of upload: 09 July 2013).

**Plate 11.9 KD023-019 – from north**

**KD023-020**
**Class**: Church
**Townland**: BALLYMANY
**Description**: According to Keeley (www.excavations.ie – 1989:054), in 1989 proposed construction of the Droichead Nua By-Pass necessitated archaeological investigation at the site (Licence no. E000484), which was financed by Kildare County Council. A church is marked on Alexander Taylor's 1783 Map of County Kildare, but no other cartographic evidence exists. An article in the Journal of the Kildare Archaeological Society refers to the remains of a church at the site (Fitzgerald 1903-5), and although local tradition placed the church somewhat to the north of Taylor's location, it was considered prudent to investigate further. It was soon evident that much disturbance owing to extensive quarrying had taken place in the area. Though a considerable area was investigated, no evidence of the church was discovered at the site (Source: www.archaeology.ie; Date of upload: 28 May 2012).

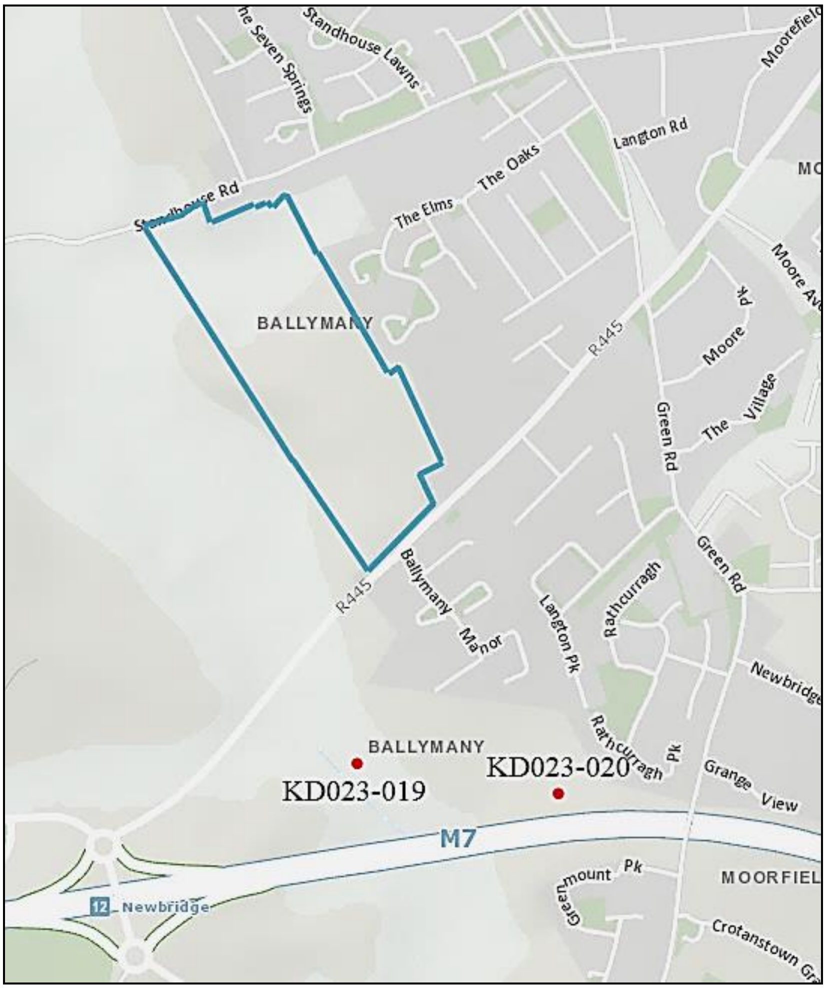


**Figure 11.9 Locations of Archaeological Monuments within defined Study Area (Overall landholding marked blue)**

### *11.6.3 Archaeological Artefacts*

No ‘artefacts are listed in the Topographical Registers of the National Museum of Ireland as having been discovered from the site or immediate environs.

### *1016.4 Results from previous documented relevant archaeological investigations*

A search undertaken of the annual Archaeological Excavations Bulletin (www.excavations.ie) indicates that a number of licenced archaeological investigations have been undertaken in Newbridge and environs, one of which was located within the subject site, as follows:

**Ballymany – Licence No: 16E0645**
A programme of Archaeological Testing was undertaken within the extent of the subject development site in 2016 by David Murphy, John Cronin & Associates.

Given the nature of the central and southern areas of the site, where the previous extractive development reduced the levels into the archaeologically sterile geological-derived sands and gravels, it was considered that only the northern area of the site might possibly contain subsurface features and artefacts of archaeological interest or potential. Consequently, a total of 13 trenches were machine excavated in the northern site area, the locations of which are illustrated in Figure 11.10. The trenching took the form of a single centre-line trench (T1) and 12 offset trenches (T2 – T13) extending at right angles to T1 and at intervals of approximately 18m

**Figure 11.10 Locations of Archaeological Test Trenches excavated in the northern area of site (16E0645)**

Nothing of archaeological interest and/or potential was uncovered in T2 – T9 and for much of the length of T1; however, subsurface features of possible archaeological interest/potential were uncovered in the western third of T1 central areas of T10, T11, T12 and T13, as follows:

**T1:** At 15m from the western end of the trench a linear cut-feature (ditch?), extending across the trench was uncovered at a depth of approx. 0.5m below ground level (bgl); it was up to 2.2m wide and limited hand investigation indicated that it was at least 0.7m in depth with steeply-sloping sides; no datable finds were recovered and the feature does not correspond to any recorded field boundaries.

A second linear cut-feature (ditch?) was uncovered approx. 40m east of the first and at a depth of approx. 0.8m bgl. It extended across the ditch and was up to 2.5m in width; limited hand investigation indicated that it was at least 0.7m in depth, with steeply-sloping sides and filled with a mix of grey/brown coarse sand and clay silt; no datable finds were recovered, and the feature does not correspond to any recorded field boundaries.

**T10:** A curvilinear cut feature was revealed at a depth of approx. 0.9m bgl within the central southern area of the trench; it measured approx. 8m in length, with the northern end extending into the western edge of the trench with the definition at the southern end less clear; limited hand investigation indicated that it contained two fills – the basal was up to 0.11m in thickness and consisted of grey-reddish/brown clayey-silt with coarse sand inclusions and the upper was up to 0.34m in thickness consisting of soft, friable, reddish/brown clayey-silt; some occasional bone fragments & a flake of struck flint were recovered from the upper fill; the cut was up to 0.8m wide and 0.45m deep, incorporating a sharp break in slope at the top, with steeply sloping sides to a gradual break in slope to the base, giving a U-shaped profile; no datable finds were recovered and the feature does not correspond to any recorded field boundaries.

**T11:** A long, narrow linear feature was uncovered at a depth of up to 0.7m bgl, from the intersection with T1 in a southerly direction for a distance of approx. 5m before extending into the western edge of the trench; it was 0.4m in width and filled with loose, dark-brown sandy-clay; a small sherd of possible prehistoric pottery and some bone fragments were recovered from the fill; the feature does not correspond to any recorded field boundaries.

A small oval feature was uncovered at approx. 9.4m to the south of the intersection with T1; it measured 0.4m (NNW-SSE) x 0.3m (ENE- WSW) and extended into the eastern edge of the trench; the fill consisted of compact dark-brown clayey-silt with moderate inclusions of charcoal.

A sub-oval feature was uncovered approx. 10.6m to the south of the intersection with T1; it measured 1.1m (NNW-SSE) x 0.8m (ENE-WSW) and extended under the eastern edge of the trench; the fill consisted of loose clayey-silt with frequent charcoal flecks and occasional inclusions of bone, some of which was burnt.

A possible ditch was uncovered crossing the trench at approx. 15.5m to the south of the intersection with T1; it was up to 1.3m in width and the fill consisted of moderately compact grey/brown clayey-silt with occasional inclusions of charcoal flecks; possible redeposited subsoil was noted in the centre of the feature; no datable finds were recovered, and the feature does not correspond to any recorded field boundaries.

A charcoal-rich subcircular feature was uncovered approx. 3.3m south of the possible ditch; it extended under the western edge of the trench and measured 0.7m (NNW-SSE) x 0.45m (ENE-WSW) where visible; the fill consisted of friable, dark-brown silt with moderate inclusions of charcoal flecks.

A possible ditch feature was uncovered approx. 34m to the south of the intersection with T1 and extended across the trench; it was up to 1.2m wide and filled with moderately compacted brown/grey clayey-silt; no datable finds were recovered, and the feature does not correspond to any recorded field boundaries; no datable finds were recovered, and the feature does not correspond to any recorded field boundaries

**T12:** A number of subcircular features were uncovered at a depth of approx. 0.4m bgl and to the south of the intersection with T1; the largest was a probable pit, 0.9m E-W x 0.7m N-S and filled with soft, dark-grey/brown silty clay with frequent charcoal inclusions; it was surrounded by three possible stakeholes positioned 0.15m – 0.5m from the west and southwest edges and with typical surface dimensions of 0.1m (E-W) x 0.08m (N-S).

**T13:** A linear cut-feature was uncovered at a depth of 0.75m bgl to the immediate south of the intersection with T1; it extended across the trench in a NE-SW orientation and ranged in width from approx. 1 – 2m; limited investigation indicated that it was at least 0.2m deep and filed with yellow/brown silty sand with clay inclusions.

An additional linear cut-feature, running across the trench in a general ENE-WSW orientation, was uncovered a little further to the south of the first; It was up to 1m in width and filled with grey/brown sandy silt with inclusions of bone fragments.

### *11.6.5 Summary Results of Additional Archaeological Testing*

As noted above in Section 6.4, a previous programme of Archaeological Testing was undertaken within the extent of the overall landholding in 2016 by David Murphy, John Cronin & Associates (Licence No: 16E0645). A number of subsurface features were uncovered, and it was subsequently recommended by the Department of Culture, Heritage and the Gaeltacht that supervised removal of topsoil in this localised area should be undertaken in order to determine the extent of the archaeological features. Such additional investigations were undertaken in August 2020 by Martin Byrne, Byrne Mullins & Associates (Licence No: 20E0369), which involved the topsoil stripping of an area measuring 70m x 70m, the approximate extent of which is illustrated below in Figure 11.11. It was considered that such an area would allow for the overall exposure of all the features of archaeological potential uncovered in 2016 and to determine the general extent and archaeological nature of such features.

The uppermost 300-400mm of the ground surface was stripped using a bulldozer due to the dense extent of undergrowth across the site. An excavator fitted with a toothless ditching bucket was then utilised to strip the remaining topsoil/ploughsoil onto the surface of the underlying subsoil, during which time the surface remains of a number of features were exposed. These features were subsequently hand-cleaned. In addition, hand-cleaning of other areas, where features were expected to be uncovered, based on the results of the 2016 programme of archaeological testing, were also subject to hand cleaning and inspection. Where exposed features were determined to be of archaeological interest/potential, then such were subsequently recorded.

**Figure 11.11 Extent of topsoil stripping/investigation area (20E0369)**

A total of eleven features of archaeological interest/potential were uncovered, the locations of which are illustrated in Figures 11.12 and 11.13, the former of which illustrates that all were uncovered in the northern area of the overall cutting.

Figure 11.12 Centre-point locations of recorded features within cutting

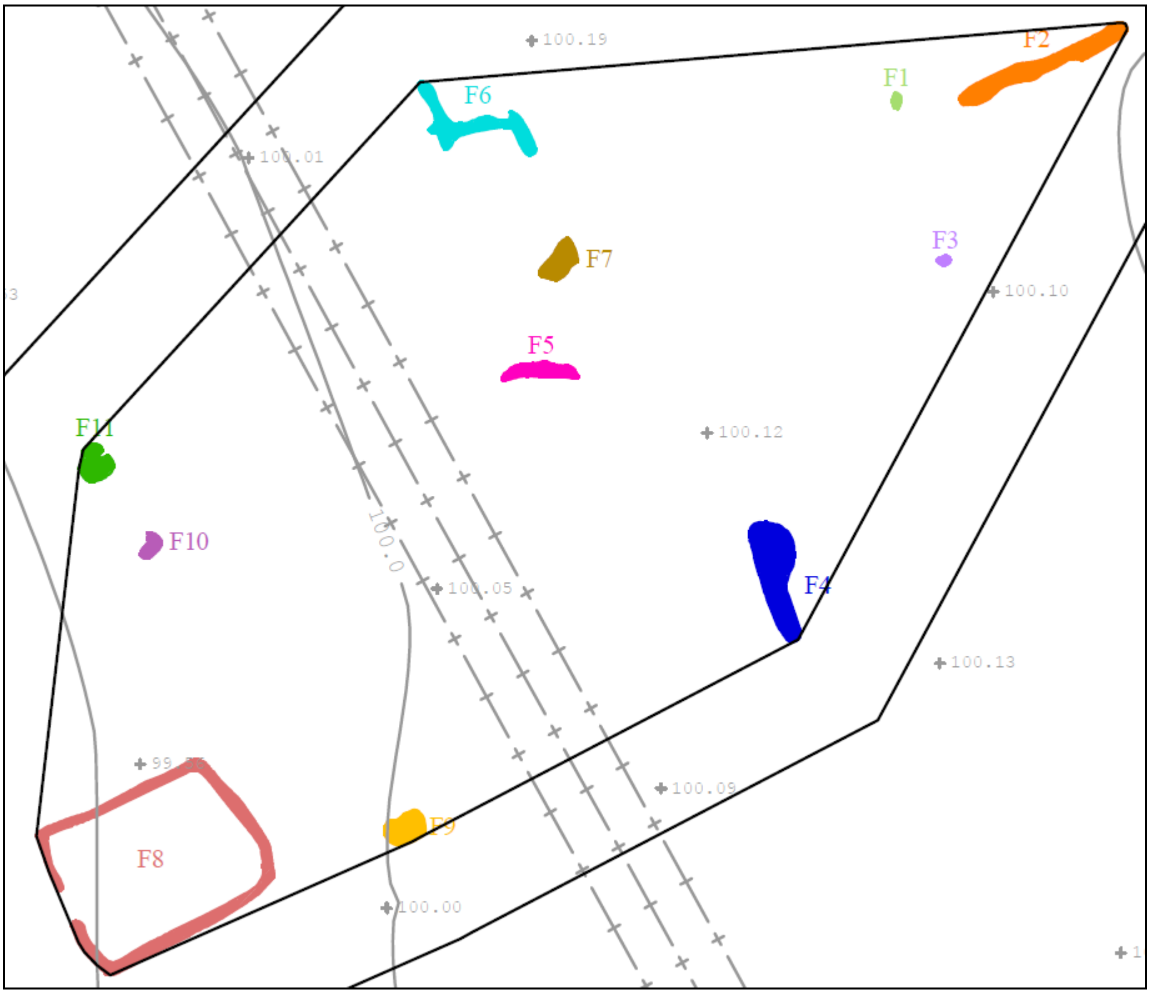


Figure 11.13 Locations and Extents of Features

Descriptions of the features uncovered during the subject programme of archaeological investigations are included in Appendix 10.2. In summary, a total of eleven features of archaeological interest/potential were uncovered; many of these were coincidental with the limited evidence for features uncovered by the programme of archaeological testing undertaken in 2016 (Licence No: 16E0645). In particular, a partial linear feature, a partial sub-oval feature and two possible ditch-features uncovered in T11 appear to be coincident with F6, F7, F5 and F4, respectively, although no evidence for an additional partial oval-feature was uncovered; two partial subcircular features uncovered in T12 appear to be F10 and F11; a possible linear feature in T1, together with two adjacent linear features uncovered to the south of this in T12, appear to be coincident with natural linear variations in the subsoil, where bands/veins of loose sand and firmer clayey subsoil aligned east-west were noted (Plate 11.10) both here and elsewhere within the cutting. A possible cut feature in T1, approximately 40m from the western end of the trench was determined to be a possible geotechnical trial pit, associated with the previous quarrying activities while no evidence for a curvilinear cut-feature in the southern central area of T10 was uncovered, although there were a number of natural variations in the subsoil in this area of the cutting. No evidence for F1, F2, F3, F8 or F9 was uncovered in 2016 and all were positioned between the trenches excavated at that time.

**Plate 11.10 Natural linear variations in the subsoil**

The brief for the subject investigations did not include for any testing of the features and, consequently, the exact nature of such remains inconclusive. However, the surface nature of some of the features does indicate possible functions of significant archaeological interest/potential; the surface evidence from F1, F3, F7, F9, F10 and F11 is indicative of pit-features, while the key-hole shape of F4 is indicative of a possible corn-drying kiln and F2 and F5 may be related to relict boundaries; in particular, F8 is indicative of a probable house-structure with west-facing entrance and of possible prehistoric or early medieval date; the nature/extent of F6 is such that its possible function is inconclusive.

No artefacts of archaeological/historical interest were recovered during the process of the investigations. The features were subsequently covered with geotextile material and covered with a depth of soil.

## 11.7 Architectural Heritahe

### *11.7.1 Introduction*

Architectural heritage has several definitions and meanings for people. A useful rule of thumb (which is actually the legal situation) is set out in the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999 which provides the following definition:

a) Structures and buildings together with their settings and attendant grounds, fixtures and fittings,

b) Groups of such structures and buildings, and

c) Sites, which are of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest.

A rich architectural heritage has survived to the present day in County Kildare. While there are impressive demesne features and large houses in the County, many of the County’s architectural heritage has come from vernacular traditions with local craftsmen sometimes borrowing from the traditions of classical architecture to construct buildings that met local needs. This rich architectural heritage contributes enormously to the overall built environment and, indeed, helps to give it definition in terms of place and character for those that live and work in the county as well as those who visit here.

### *11.7.2 Record of Protected Structures (Kildare County Development Plan 2017-2023 & Newbridge Local Area Plan 2013-2019)*

Section 51 of the Planning and Development Act, 2000 (as amended) requires the Development Plan to include a record of structures. These structures form part of the architectural heritage of the County and are to be protected.

Kildare County Council has drawn up this list, referred to as the Record of Protected Structures (RPS), in which each structure is given a reference number and is a constituent part of the County Development Plan; where applicable, these structures are also contained in relevant Local Area Plans (e.g., Newbridge Local Area Plan 2013-2019).

There are no structures listed in the Record of Protected Structures (RPS) of the Kildare County Development Plan 2017-2023 as being located within the subject study area associated with the development.

### *11.7.3 National Inventory of Architectural Heritage (NIAH)*

The National Inventory of Architectural Heritage (NIAH) is a state initiative under the administration of the Department of Culture, Heritage and the Gaeltacht. It was established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. Its purpose is to identify, record, and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. It is intended that the NIAH will provide the basis for the recommendations of the Minister for Culture, Heritage and the Gaeltacht to the planning authorities. The NIAH includes structures and garden features.

There are no structures of Architectural Heritage interest listed by the non-statutory NIAH as being located within the subject study area; likewise, there are no NIAH Garden Survey sites located within the defined study area.

## 11.8 Impacts of Development

### *11.8.1 Impact Criteria*

The following Table 1 (from EPA, 2017, Table 3.3) provides the baseline criteria used to describe the impacts (effects) that the proposed development will have on Cultural Heritage Sites, Structures and Features.

| | |
|---|---|
| **Quality of Effects** | **Positive Effects**<br>**A change which improves the quality of the environment**<br>**Neutral Effects**<br>**No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.**<br>**Negative/adverse Effects**<br>**A change which reduces the quality of the environment** |
| **Significance of Effects** | **Imperceptible**<br>An effect capable of measurement but without significant consequences.<br>**Not significant**<br>An effect which causes noticeable changes in the character of the environment but without significant consequences.<br>**Slight Effects**<br>An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.<br>**Moderate Effects**<br>An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.<br>**Significant Effects**<br>An effect which, by its character, magnitude, duration or intensity alters a sensitive |

| | |
|---|---|
| | aspect of the environment.<br>**Very Significant**<br>An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.<br>**Profound Effects**<br>An effect which obliterates sensitive characteristics |
| **Extent and Context of Effects** | **Extent**<br>Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.<br>**Context**<br>Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions |
| **Probability of Effects** | **Likely Effects**<br>The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.<br>**Unlikely Effects**<br>The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented. |
| **Duration and Frequency of Effects** | **Momentary Effects**<br>Effects lasting from seconds to minutes<br>**Brief Effects**<br>Effects lasting less than a day<br>**Temporary Effects**<br>Effects lasting less than a year<br>**Short-term Effects**<br>Effects lasting one to seven years.<br>**Medium-term Effects**<br>Effects lasting seven to fifteen years.<br>**Long-term Effects**<br>Effects lasting fifteen to sixty years.<br>**Permanent Effects**<br>Effects lasting over sixty years<br>**Reversible Effects**<br>Effects that can be undone, for example through remediation or restoration<br>**Frequency of Effects**<br>Describe how often the effect will occur. |

**Table 11.1 Baseline Criteria & Impacts**

### *11.8.2 Construction Phase*

#### *11.8.2.1 Local History*

The general historical background to the subject development area is discussed above in Section 10.5. In summary, there are no significant historical events associated with the proposed development lands which have the ability to be impacted upon by the proposed development.

#### *11.8.2.2 Archaeological Heritage*

The general archaeological background to the subject development area is discussed above in Section 6. There are no Recorded Monuments located within, or in the immediate environs of, the subject development lands.

The central and southern areas of the site have been the subject of significant ground reduction and disturbance works, associated with a previous extractive development. Any previously unidentified subsurface archaeological remains that might have existed in these areas would have been removed by such previous development and, consequently, these areas of the site are archaeologically sterile.

The programme of Archaeological Testing of the relatively undisturbed and undeveloped northern area of the site, undertaken in 2016 resulted in the discovery of a number of subsurface features of archaeological interest and/or potential; these included possible ditches which do not correspond to any field boundaries marked in historic Ordnance Survey maps and a number of possible pits and stakeholes. In many cases the fills of these ‘cut’ features contain fragments of bone and charcoal; in addition, a sherd of possible prehistoric pottery and a piece of struck flint were recovered. All these features are located in the south-western area of the northern undisturbed lands and clustered in the western third of T1 and southern lengths of T10, T11, T12 and T13. No other features of archaeological interest/potential were uncovered outside this cluster.

Following consultation with the National Monuments Service, Department of Culture, Heritage and the Gaeltacht additional investigations were undertaken in August 2020 (Licence No: 20E0369), which involved the topsoil stripping of an area measuring 70m x 70m; it was considered that such an area would allow for the overall exposure of all the features of archaeological potential uncovered in 2016 and to determine the general extent and archaeological nature of such features. In summary, a total of eleven features of archaeological interest/potential were uncovered; many of these were coincidental with the limited evidence for features uncovered by the programme of archaeological testing undertaken in 2016 (Licence No: 16E0645). In particular, a partial linear feature, a partial sub-oval feature and two possible ditch-features uncovered in T11 appear to be coincident with F6, F7, F5 and F4, respectively, although no evidence for an additional partial oval-feature was uncovered; two partial subcircular features uncovered in T12 appear to be F10 and F11; a possible linear feature in T1, together with two adjacent linear features uncovered to the south of this in T12, appear to be coincident with natural linear variations in the subsoil, where bands/veins of loose sand and firmer clayey subsoil aligned east-west were noted (Plate 11.10) both here and elsewhere within the cutting. A possible cut feature in T1, approximately 40m from the western end of the trench was determined to be a possible geotechnical trial pit, associated with the previous quarrying activities while no evidence for a curvilinear cut-feature in the southern central area of T10 was uncovered, although there were a number of natural variations in the subsoil in this area of the cutting. No evidence for F1, F2, F3, F8 or F9 was uncovered in 2016 and all were positioned between the trenches excavated at that time. The surface nature of some of the features does indicate possible functions of significant archaeological interest/potential; the surface evidence from F1, F3, F7, F9, F10 and F11 is indicative of pit-features, while the key-hole shape of F4 is indicative of a possible corn-drying kiln and F2 and F5 may be related to relict boundaries;

in particular, F8 is indicative of a probable house-structure with west-facing entrance and of possible prehistoric or early medieval date; the nature/extent of F6 is such that its possible function is inconclusive.

The development proposes that the all the subsurface features of archaeological interest/potential will be preserved ‘in-situ’ and contained within a green/public space area (Public Space B) bounded to the west by the link road and associated footpath and to the north, east and south by internal access roads and associated footpaths, as illustrated in Figure 11.14. This will result in a minimum buffer area around the features of 5m, particularly with respect to F2, F4 and F5. Consequently, as the features will not be disturbed and preserved ‘in-situ’ it is considered that the likely effect on such features will be positive, not significant and permanent.

**Figure 11.14 Extent of Archaeological Buffer Zone within Public Space B**

It is noted that a number of the features of archaeological interest/significance (F1, F2, F3, F8 & F9) uncovered by the second (2020) phase of archaeological investigations were positioned between the archaeological test trenches excavated during the original phase of testing in 2016. Consequently, there is potential for further subsurface archaeological remains to be uncovered within the construction corridor of the link road from its position running north from the central, previously quarried area of the site; without the adoption and implementation of a suitable mitigation strategy, any such features that might existing within this section of the link road would be destroyed and not recorded, resulting in a potential profound, negative and permanent effect.

#### *11.8.2.3. Architectural Heritage*

As noted above in Sections 10.7.2 and 10.7.3, there are no structures listed in the Record of Protected Structures (RPS) of the Kildare County Development Plan 2017-2023, the Newbridge Local Area Plan 2013-2019 or by the National Inventory of Architectural Heritage (NIAH) as being located within, or in the immediate environs of, the subject proposed development lands. Consequently, no such structures have the ability to be impacted by the construction phase of the development.

### *11.8.3 Post-construction/Operational Phase*

There are no extant archaeological monuments or structures of architectural heritage interest located within, or in the general environs of, the subject development lands. Consequently, it is not predicted that the visual setting of any archaeological monument or architectural heritage structures will be impacted following completion of the proposed subject development

## 11.9. Mitigation Measures

As noted above in Sections 11.8.2.1, 11.8.2.3 and 11.8.3, it is not considered likely that any direct or indirect/visual impacts will occur to features/structures of historical or architectural heritage interest as a results of the construction or subsequently operation of the proposed development; likewise, as also noted in Section 11.8.3, no impacts will occur to the settings of any Recorded Archaeological Monuments as a results of the operation of the proposed development.

However, as noted in Section 11.8.2.2, archaeological investigations within the south-western area of the northern site area have uncovered a cluster of eleven subsurface archaeological features of significant archaeological interest. The cluster of eleven archaeological features will be located within a proposed green/public space area and preserved ‘in-situ’ and a minimum 5m buffer area around the subsurface archaeological remains will be permanently established.

Furthermore, although no features of archaeological potential were uncovered by the original programme of archaeological testing in 2016 in the remaining northern area of the site (i.e. the area not previously disturbed by extractive works and outside the area where the cluster of features was uncovered) it is noted that six of the archaeological features uncovered during the second phase of archaeological investigations (2020) were discovered in areas between the original test trenches. Consequently, there is an associated increase in the potential that additional subsurface archaeological features might be located within the overall northern site area.

Consequently, in light of the above, particularly in light of the disturbed nature of the southern and central areas of the site and the results of the two programmes of archaeological testing/investigations, the following mitigation strategy is recommended:

1. No further archaeological interventions, including monitoring, are required with respect to the southern and central areas of the site which were the subject of the previous ground reduction works associated with the former extractive development.

2. Prior to the commencement of any development works in the northern area of the site (i.e., the area not previously disturbed by extractive works), a buffer area of 5m should be established around the extent of the archaeological cluster (F1 – F11). The extent of this buffer zone is illustrated in Figure 11.14 above and should be established by the erection of a post-and-wire fence. No construction materials, including spoil, should be stored, and no temporary structures (e.g., offices etc.) should be sited, within the buffer area; likewise, no construction vehicles should enter the buffer area.

3. No trees should be planted within the extent of the archaeological buffer zone indicated in Figure 11.14. However, shallow-rooted plants are permissible but should not be positioned over the immediate locations of the subsurface archaeological features, the extents of which are indicated in Figure 11.13.

4. Removal of any soil from the spoil mounds located in the northern area of the site should only be done onto the ground surface level of the undisturbed lands to the immediate north. The existing buried topsoil horizon should not be disturbed.

5. All topsoil/ploughsoil stripping onto the surface of the underlying subsoil layers/horizons in the northern area of the site, as indicated in Figure 11.15, should be monitored by an archaeologist and under licence to the Department of Culture, Heritage and the Gaeltacht. In particular, such works associated with the construction corridor associated with the link road within this area, which is scheduled to commence in the immediate future, should be monitored.

6. In the event of additional subsurface features being uncovered during the course of such monitoring, works in the immediate area of such features

should cease and the advice of the National Monuments should be sought to determine what additional action should be implemented.

7. In the event that the cluster of archaeological features uncovered by the two programmes of archaeological investigations cannot be preserved *in-situ* by the existing or future development, then a programme of full archaeological excavation (preservation by record) and associated post-excavation programme will be required, funded by the developer and subject to approval with the National Monuments Service, Department of Housing, Local Government & Heritage.

**Figure 11.15 Suggested Extent of Archaeological Monitoring**

## 11.10 Residual Impact

It is not envisaged that any negative residual effects will occur with respect to Cultural Heritage as a result of the project proceeding as proposed with the adoption of the archaeological mitigation strategies outlined in Section 10.8.2.2. (Figure 11.14) and Section 11.9, and the implementation of such mitigation strategies.

## 11.11 Cumulative Impact

The cumulative impact of the proposed development and other existing and/or approved developments in the area of the project was assessed by considering the existing baseline environment and the predicted impacts of this and other approved developments. It is not envisaged that any negative cumulative effects will occur with respect to Cultural Heritage as a result of the project proceeding as proposed.

## 11.12 ‘Do Nothing’ Scenario

If the development does not proceed the site will remain in its current condition, with no changes to the potential impacts on the overall cultural heritage.

## 11.13 Interactions

No Interactions have been identified

# 12. MATERIAL ASSETS

This Chapter of the Environmental Impact Assessment Report has been prepared by Muir Associates Consulting Engineers and deals with the topic of Material Assets. The Chapter covers Built Services, Roads and Traffic and Waste Management. Each of these topics is dealt with in separate sections following.

## 12.1 Built Services

### *12.1.1 Introduction & Methodology*

This section of the Chapter deals with the topic of Built Services and examines the potential impacts of the proposed development on the existing underground and overground communications, gas and electricity supply together with water supply and wastewater infrastructure. The methodology used in assessing the impact of the proposed development in this chapter has primarily relied on desk top studies of the available services record information provided by the service providers.

Communications supply relates to the overhead lines and underground telecommunication cables, which form part of existing networks.

Gas supply relates to the existing underground medium pressure gas network which forms part of the existing Gas Networks Ireland underground gas network.

Electricity supply relates to both the local Low Voltage (LV), Medium Voltage (MV) such as the 20kV networks which supply local houses and businesses; and high voltage 38kV, 110kV and 220kV lines which form part of the electricity system.

In considering the impact of the proposed development on the existing water and wastewater infrastructure, the demands on the existing services networks have been estimated and assessed against the available capacity.

### *12.1.2 Description of Receiving Environment*

The Built Services in the area are mainly made up of overhead and underground telephone and electricity lines, underground gas supply pipes and piped water and wastewater infrastructure.

The existing gas supply network is almost entirely underground and consists of a medium pressure piped distribution network. There are existing medium pressure gas supply pipes located in the R445 Ballymany Road to the southeast of the proposed development and the piped gas network extends along Standhouse Road to serve the existing Seven Springs housing estate to the north of the proposed development. The existing residential development to the northeast of the proposed development is also serviced by a piped gas supply.

There was an existing 38kV overhead electricity power line which ran through the site close to the southwestern boundary. This overhead line has been undergrounded as part of the phase of permitted development currently under construction on the site. This overhead power line linked the Newbridge 110kV substation located at Roseberry, Newbridge with the Athgarvan 38kV substation located at Crotanstown Road, Walshestown. There are also existing MV electricity lines traversing the site which are being undergrounded as part of the phase of permitted development currently under construction on the site.

There are existing overhead LV electricity supply cables along the Ballymany Road and along Standhouse Road. The adjoining residential areas are generally served by underground MV and LV electricity cables.

Both Eir and Virgin have existing cable networks along Ballymany Road and Standhouse Road.

There is an existing 100 mm diameter uPVC watermain along the R445 Ballymany Road immediately to the southeast of the site. There is also an existing 50mm diameter watermain located on the northern boundary of the site on Standhouse Road. These existing watermains are shown on the available Irish Water record maps. A copy of these maps is presented in the engineering report which accompanies this application

There is an existing 225mm diameter foul sewer located in the R445 Ballymany Road immediately to the southeast of the proposed development and an existing 225mm diameter foul sewer located in Standhouse Road to the northwest of the site. These foul sewers discharge in a north-easterly direction into the wider Newbridge foul sewer network and both sewers discharge into the existing foul sewer in Moorefield Road. The Newbridge foul sewer network ultimately discharges into the Irish Water Osberstown wastewater treatment plant.

The existing local foul sewers in the vicinity of the proposed development are shown on the available Irish Water record maps and a copy of these record maps is presented in the engineering report which accompanies this application.

### *12.1.3 Assessment of Potential Impacts*

#### Construction Phase

During the construction phase of the proposed development, it is proposed to underground any remaining overhead cables which are on the site. This will have a long term positive impact.

There will be no fixed communications networks operational during the construction phase of the proposed development.

There will be a requirement for an electricity supply during the construction phase of the proposed development. This supply will be provided on a temporary basis and the potential impact of the proposed development on the local electrical supply network is likely to be short-term and not significant.

There will be no construction impact on the existing gas supply.

During the construction phase of the proposed development the existing water supply network will experience an increase in demand due to the use of the facilities by construction staff. While such an increase will have a negative impact, it will be imperceptible and will be short-term in nature.

During the construction phase of the proposed development the existing wastewater network will experience an increase in discharge due to the use of the facilities by construction staff. While such an increase will have a negative impact, it will be imperceptible and will be short-term in nature.

**Operational Phase**

The proposed development will include the installation of underground communications cable networks. These will generally follow the proposed road network and the cables will be provided within a ducted network. The impact of the operational phase of the proposed development on the communications networks is likely to be an increase in demand. The potential impact from the operational phase on the telecoms network is likely to be long term and not significant.

The proposed development will include the installation of an underground ducted electricity distribution supply network together with frequent above ground mini pillars and a number of kiosk type substations. The impact of the operational phase of the proposed development on the electricity supply network will be an increase in the demand on the existing electricity supply. The potential impact of the operational phase of the proposed development on the electricity supply network is likely to be long term and slight.

As it is not proposed to install a gas supply to the proposed development there will be no related operational impact on the existing gas supply network.

The proposed development will result in an increase in peak water demand of 9.89 litres per second with an average daily water demand of 137m3/day. Such an increase will result in a minor long-term negative impact on the existing water supply network.

The completion of the proposed development will result in an additional peak wastewater discharge of 9.48 litres per second to the existing wastewater network. Such an increase will result in a minor negative impact on the existing wastewater drainage network.

### *12.1.4 Mitigation and Monitoring*

During the construction phase of the proposed development, it will be necessary for the contractor to implement measures to mitigate potential impacts arising from the installation of the proposed underground service networks. These measures are set out in the Outline Construction Management Plan which is included as a standalone report accompanying this application.

As part of the operational phase of the proposed development smart metering should be installed to allow future occupants of the proposed development to measure energy use.

Any necessary connections to the existing wastewater or water supply networks will be undertaken in agreement with and approval of Irish Water and appropriate procedures will be followed to ensure that there is no impact on the operation of the existing wastewater and waters supply networks.

Irish Water have confirmed that subject to a valid connection agreement being put in place, the proposed connection to the Irish Water potable water supply network can be facilitated subject to the completion of a number of water network upgrades. These upgrades will be implemented as part of the proposed development in agreement with Irish Water.

It is proposed to connect the foul drainage discharge from the proposed development to the existing 225 mm diameter foul sewer located in Standhouse Road. The foul sewer outfall will require the replacement of a 270m section of the existing foul sewer in Standhouse Road and this upgrade will be implemented as part of the proposed development in agreement with Irish Water. Irish Water have confirmed that the proposed connection to the wastewater network can be facilitated subject to the completion of the Upper Liffey Valley Regional Sewerage Scheme Contracts 2A and 2B which are due to be completed by February 2021.

### *12.1.5 Assessment of Residual Impacts*

It is likely that, with the implementation of the mitigation measures described above, the residual impact of the construction phase associated with the proposed development will be short-term but imperceptible and the impact of the operational phase of the proposed development will be long term but will not be significant.

### *12.1.6 Interactions*

There is a potential for interaction as a result of the impacts of Built Services on the following environmental topics:

- Land, Soils and Geology;
- Hydrology and Water;
- Waste management;

### *12.1.7 Cumulative Impacts*

The potential impact on the Built Services environment when considered in combination with other known projects in the immediate area, including the Phase 1 development on the lands, are likely to be long term but will not be significant – provided mitigation measures are implemented for each of the developments.

### *12.1.8 'Do Nothing' Scenario*

In the event that the proposed development does not proceed then it is likely that the extant planning permission on the lands (Kildare County Council File Number 16/658; ABP Reference PL09.249038) will be implemented. In such circumstances the likely impacts will be similar to the impacts identified for the subject development.

## 12.2 Roads and Traffic

### *12.2.1 Introduction & Methodology*

This section of the Chapter deals with the topic of Roads and Traffic and examines the potential impacts of the proposed development in the context of vehicular traffic, public transport together with pedestrian and cycle movements.

The methodology used in assessing the Roads and Traffic impacts of the proposed development has primarily been based on a review of available modes of travel in the area and on the modelling of the potential impact of the proposed development on the surrounding road network. This chapter has also relied on the Traffic and Transport Assessment prepared by PMCE and which is included as a standalone report accompanying this application.

### 12.2.2 Description of Receiving Environment

The existing road network in the vicinity of the proposed development is predominantly peri-urban with a posted speed limit of 50kph along the R445 Ballymany Road from the M7 Motorway Junction 12 interchange, and along Standhouse Road, leading towards Newbridge Town Centre.

The R445 Ballymany Road is a two-way single carriageway road which, in the vicinity of the proposed development, runs from the M7 Motorway Junction 12 north-eastwards. Between the M7 Motorway and its junction with Langton Road, in Newbridge Town Centre, the R445 provides one traffic lane in each direction with no hard shoulder. There is an existing footpath on the southern side of the R445 between the proposed development and Newbridge Town Centre. There is no footpath on the northern side with a wide verge provided in the vicinity of the proposed development and a footpath developing further east on the approach to the Town Centre.

The Standhouse Road runs in a southwest to northeast direction from its roundabout junction with the R413 in the west to its junction with Langton Road and Morristown Road in the east in Newbridge Town Centre. Standhouse Road is a two-way single carriageway road with a paved carriageway width of approximately 6m. There is centreline, and edge of carriageway, road markings on Standhouse Road. The posted speed limit is 50kph. There are a number of dwellings located along the road with direct access to/from the local road.

There are no dedicated cycle tracks in the immediate vicinity of the proposed development.

### 12.2.3 *Assessment of Potential Impacts*

#### Construction Phase

During the construction phase of the proposed development there will be increased vehicular movements associated with construction traffic. There may also be an increase in noise, and potentially dust, generated from construction related traffic which may cause disruption to people, groups or other activities located close to the proposed development. There will also be an increase in road traffic levels due to construction related activities supplying and accessing the site using the existing road network. Such impacts will be short-term and not significant.

#### Operational Phase

The assessment of the potential impacts of the proposed development included planned permitted developments and the impact of the recently granted planning permission (reference ABP 311040 – 21) was included via a sensitivity assessment. A summary of the potential impacts of the proposed development on the adjacent road network based on the traffic modelling undertaken is presented below:

Link capacity analysis was carried out on the R445 Ballymany Road and the L7037 Standhouse Road within the vicinity of the proposed development.

- It was determined that Standhouse Road will continue to operate within capacity for each of the assessment years 2024 (Opening Year), 2029 and 2039.
- The R445 Ballymany Road currently operates above capacity and will continue to do so for each of the assessment years with and without the development. The AADTs forecast for the future assessment years, however, indicate that traffic generated by the development will have a negligible impact on traffic flows (between 2.81% and 3.83%).

Junction capacity analysis was undertaken for three scenarios. **Scenario 1** assessed the assignment of the forecast development traffic onto the adjacent road network and is based on the existing traffic flow distribution at each junction as derived from the traffic counts. This scenario analysed the capacity of the following junctions:

- Proposed Standhouse Road Development Access
- Morristown Road Signalised Junction
- Proposed R445 Development Access

The proposed development accesses will operate within capacity for each of the assessment years 2024, 2029 and 2039 for all scenarios assessed. However, the Morristown Road signalised junction is currently operating, and will continue to operate, above capacity, with and without the proposed development, for all future assessment years. It is however considered that the impact that the proposed development traffic will have on the junction will not be significant. Capacity issues occur during the AM and Peak periods and are below capacity for the rest of the day. However, this is considered to be representative of signalised junctions within urban and peri-urban locations.

**Scenario 2** assessed the two development accesses, on the R445 and on Standhouse Road, and the Morristown Junction assuming a portion of existing traffic has been redistributed through the development access road as a means of bypassing Newbridge Town Centre. The results of the analysis indicate that the development access junctions will operate within capacity for assessment years 2024, 2029 and 2039. The Morristown Junction however will operate above capacity with long delays experience. These delays are greater than the current delays at this junction. However, it should be noted, that the primary motivation for drivers using the new residential access in Scenario 2 is to reduce their journey time. Where journey times are not reduced, existing traffic will avoid this route during peak hours, thus reducing the identified delays.

**Scenario 3** assessed a proposed future signalised junction on the R445 which will provide an additional access to this development as well as providing access to a proposed future development on the southern side of the R445 which is currently at the planning stage. The results of the analysis indicate that the junction will operate within capacity for assessment years 2024, 2029 and 2039.

The Traffic and Transport Assessment prepared by PMCE together with the Engineering Planning Report prepared by Muir Associates provide more detailed information in relation to the impact of the proposed development of on the receiving environment. These reports are included as standalone reports accompanying this application.

### 12.2.4 *Mitigation and Monitoring*

#### Construction Phase

Prior to the commencement of the works on site the contractor will prepare a detailed Construction Traffic Management Plan and agree the related proposals with the Planning Authority and An Garda Síochána based on the measures set out in the Outline Construction Management Plan which is included as a standalone report accompanying this application.

Given the location and nature of access to the site, site parking or construction parking will be located on the site

Construction vehicle movements will be minimised by the adoption of measures including:

- Consolidation of delivery loads to/from the site and managing large deliveries on site to occur outside of peak periods;
- Use of precast/prefabricated materials where possible;
- Provision of adequate storage space on the site;

- Development of a strategy to minimise construction material quantities insofar as possible;
- Construction staff vehicle movements will also be minimised by promoting, where feasible, the use of public transport and car sharing;

**Operational Phase**

Mobility management will be a key part of the proposed development strategy to encourage occupiers to use sustainable means of transport. This will include the appointment of a Mobility Manager who will be involved in monitoring the modes of travel of the occupants of the proposed development and this ideally will be done on an annual basis. The mobility manager will at the outset of the occupation of the development implement a number of key measures. These will include:

- Providing new residents with a Travel Welcome Pack providing full details of transport options, cycle/walking maps and information on local services;
- Induction sessions for new households and follow up visits;
- Instigate and regularly update a centrally located travel notice board providing travel information;

An Outline Travel Plan prepared by Muir Associates provides more detailed information in relation to the mobility management aspects of the proposed development.

### *12.2.5 Assessment of Residual Impacts*

**Construction Phase**

With the implementation of the mitigation measures proposed there should be a slight short-term impact on the surrounding road network during the construction phase of the proposed development.

**Operational Phase**

There will be an increase in traffic on the surrounding road network following the completion of the proposed development, however the traffic analyses undertaken demonstrates that there is sufficient capacity within the existing road network to accommodate this increase and the related impact will be long-term and slight. The delivery of the section of the link road from the L7042 Green Road to the L7037 Standhouse Road will have a long term positive impact.

### *12.2.6 Cumulative Impacts*

The potential impact on the Roads and Traffic environment when considered in combination with other known and planned projects in the immediate area, including the Phase 1 development on the lands, are likely to be long term and slight – provided mitigation measures are implemented for each of the developments.

### *12.2.7 'Do Nothing' Scenario*

In the event that the proposed development does not proceed then it is likely that the extant planning permission on the lands (Kildare County Council File Number 16/658; ABP Reference PL09.249038) will be implemented. In such circumstances the likely impacts will be long term but not significant.

### *12.2.8 Interactions*

There is a potential for interaction as a result of the impacts of Roads and Traffic on the following environmental topics:

- Population and Human Health;
- Land, Soils and Geology;
- Air Quality;
- Noise and Vibration;

## 12.3 Waste Management

### *12.3.1 Introduction*

This section of the Chapter addresses the subject of waste management for the proposed development. Waste management is addressed for both the construction and operational phases of the development.

An Outline Construction and Demolition Waste Management Plan (OCDWMP) has been prepared for the construction phase of the development in advance of the commencement of the construction works. The OCDWMP has been prepared in accordance with the 'Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects' document produced by the National Construction and Demolition Waste Council (NCDWC) in conjunction with the Department of the Environment, Heritage and Local Government in July 2006.

The assessment of the impacts of the proposed development arising from the consumption of resources and the generation of waste materials, was carried out taking cognisance of the methodology specified in relevant guidance documents to identify current and future requirements for waste management including national and regional waste policy, waste strategies, management plans, legislative requirements and relevant reports.

### *12.3.2 Description of Receiving Environment*

The proposed development is located in the administrative area of Kildare County Council (KCC).

The Eastern-Midlands Region (EMR) Waste Management Plan 2015-2021 provides a framework for the prevention and management of waste in a sustainable manner in twelve local authority areas. The development of the Plan involved significant interaction and consultation with stakeholders such as the

Department of the Environment, Community & Local Government, the Environmental Protection Agency (EPA), Irish Waste Management Association (IWMA), Compliance Schemes, NGOs, and members of the public. The Plan sets out the strategic targets for waste management in the region and specifies a mandatory target of 70% of C & D wastes to be prepared for reuse, recycling, and material recovery (excluding soil and stones) by 2020. This reflects the target for the management of C & D waste in the Waste Framework Directive.

The three key objectives of the Eastern-Midlands Region Waste Management Plan are:

1. Prevent waste: a reduction of one per cent per annum in the amount of household waste generated over the period of the plan;
2. More recycling: increase the recycle rate of domestic and commercial waste from 40 to 50 per cent by 2020;
3. Further reduce landfill: eliminate all unprocessed waste going to landfill from 2016;

Kildare County Council (Segregation, Storage and Presentation of Household and Commercial Waste) Byelaws were adopted in December 2018 in accordance with the Local Government Act 2001 and the Waste Management Act 1996, to regulate and control the Segregation, Storage and Presentation of Household and Commercial Waste within its functional area.

The National Waste Statistics update published by the EPA in December 2020 identifies that Ireland’s current progress against this C & D waste target is at 84% and our progress against ‘Preparing for reuse and recycling of 50% by weight of household derived paper, metal, plastic & glass (includes metal and plastic estimates from household WEEE)’ is at 53%.

Kildare County Council no longer operates any municipal waste landfill in the area. There are numerous permitted and licensed waste facilities located in the Eastern-Midlands Region Waste Management area for the management of waste from the construction industry as well as municipal sources. These include soil recovery facilities, inert C & D waste facilities, hazardous waste treatment facilities, material recovery facilities and waste transfer stations.

### 12.3.3 *Assessment of Potential Impacts*

#### Construction Phase

During the construction phase of the proposed development, waste will be produced from surplus materials such as broken or off-cuts of timber, plasterboard, concrete, tiles, bricks, etc. Waste from packaging (cardboard, plastic, timber) and oversupply of materials may also be generated. The contractor will be required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

Surplus excavated material generated will likely be suitable for acceptance at either inert or non-hazardous soil recovery facilities/landfills in Ireland. In the event of hazardous material being encountered, it will be transported for treatment/recovery or exported abroad for disposal in suitable facilities.

Waste will be generated from construction workers (e.g., organic/food waste, dry mixed recyclables wastepaper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables. Waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from site offices.

Further detail on the waste materials likely to be generated during the excavation and construction works are presented in the project-specific OCDWMP.

The proposed development will generate a range of non-hazardous and hazardous waste materials during the construction phase. General housekeeping and packaging will also generate waste materials as well as typical municipal wastes generated by construction employees including food waste.

Waste materials will be required to be temporarily stored on site pending collection by a waste contractor. Dedicated areas for waste skips and bins will need to be identified across the site. These areas will need to be easily accessible to waste collection vehicles. If waste material is not managed and stored correctly, it is likely to lead to litter or pollution issues at the development and on adjacent developments. The knock-on effect of litter issues is the presence of vermin within the development and the surrounding areas.

Recovery and recycling of C & D waste has a positive impact on sustainable resource consumption, for example where waste timber is mulched into a landscaping product or waste asphalt is recycled for use in new pavements. The use of recycled materials, where suitable, reduces the consumption of natural resources.

There is a quantity of topsoil and sub soil which will need to be excavated to facilitate the proposed development. However, if there is surplus excavated material it will need to be removed off-site. Correct classification and segregation of the excavated material is required to ensure that any potentially contaminated materials are identified and handled in a way that will not impact negatively on workers as well as on water and soil environments, both on and off-site.

The opportunities for waste materials to be reused off-site will provide positive impacts in the resourcing of materials for other developments and reduce the requirement for raw material extraction.

The potential effect of construction waste generated from the proposed development is considered to be short-term, and not significant.

### Operational Phase

All waste materials will be segregated into appropriate categories and will be stored in appropriate bins or other suitable receptacles in a designated, easily accessible areas of the site in accordance with the Kildare County Council Bye-Laws 2018.

All waste leaving the site will be recycled or recovered, with the exception of those waste streams where appropriate recycling/recovery facilities are currently not available. All waste leaving the site will be transported by contractors and taken to appropriately licenced waste facilities. All waste leaving the site will be recorded and copies of relevant documentation maintained.

The potential impacts on the environment of improper, or a lack of, waste management during the operational phase would be a diversion from the priorities of the waste hierarchy. This would lead to volumes of waste being sent unnecessarily to landfill.

The nature of the development means the generation of waste materials during the operational phase is unavoidable. Networks of waste collection, treatment, recovery and disposal infrastructure are in place in the region to manage waste efficiently from this type of development. Waste which is not suitable for recycling is typically sent for energy recovery. There are also facilities in the region for segregation of municipal recyclables which is typically exported for conversion in recycled products (e.g., paper mills and glass recycling).

The waste materials generated on a daily basis will be stored in dedicated waste storage areas.

If waste material is not managed and stored correctly, it is likely to lead to litter or pollution issues at the development and on adjacent developments. The knock-on effect of litter issues is the presence of vermin within the development and the surrounding areas.

Waste collection vehicles will be required to service the development on a regular basis to remove waste.

The use of non-permitted waste contractors or unauthorised facilities could give rise to inappropriate management of waste and result in negative environmental impacts or pollution. It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously. Time and resources should be dedicated to ensuring efficient waste management practices.

The potential impact of operational waste generation from the development is considered to be long-term and not significant.

### *12.3.4 Mitigation and Monitoring*

#### **Construction phase**

A project specific OCDWMP has been prepared for the proposed development. Adherence to the high-level strategy presented in this OCDWMP will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the construction phase of the proposed development.

The following mitigation measures will be implemented during the construction phase of the proposed development:

- Building materials will be chosen with an aim to ‘design out waste’
- On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery
- Left over materials (e.g., timber off-cuts, broken concrete blocks/bricks) and any suitable construction materials shall be re-used on-site, where possible;
- All waste materials will be stored in skips or other suitable receptacles in designated areas of the site;
- Any hazardous wastes generated will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required);
- The main contractor will appoint a waste manager to ensure effective management of waste during the excavation and construction works;
- All construction staff will be provided with training regarding the waste management procedures;
- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licenced facilities; and
- All waste leaving the site will be recorded and copies of relevant documentation maintained.

These mitigation measures will ensure that the waste arising from the construction phase of the development is dealt with in compliance with the provisions of the Waste Management Act 1996, as amended, associated Regulations, the Litter Pollution Act 1997 and the Regional Waste Management Plan. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved and will encourage sustainable consumption of resources.

### *12.3.5 Assessment of Residual Impacts*

The implementation of the mitigation measures outlined above will ensure that a high rate of reuse, recovery and recycling is achieved at the development during the construction phase as well as during the operational phase. It will also ensure that European, National and Regional legislative waste requirements with regard to waste are met and that associated targets for the management of waste are achieved.

#### Construction Phase

A carefully planned approach to waste management as set out above and adherence to the developed Construction and Demolition Waste Management Plan during the construction phase will ensure that the impact on the environment will be short-term, neutral and imperceptible.

### Operational Phase

During the operational phase, a structured approach to waste management as set out above will promote resource efficiency and waste minimisation. Provided the mitigation measures are implemented and a high rate of reuse, recycling and recovery is achieved, the predicted impact of the operational phase on the environment will be long-term, neutral and imperceptible.

### *12.3.5 Cumulative Impacts*

The potential impact on the Waste Management environment when considered in combination with other known projects in the immediate area, including the Phase 1 development on the lands, are likely to be long term but will be imperceptible – provided mitigation measures are implemented for each of the developments.

### *12.3.6 'Do Nothing' Scenario*

In the event that the proposed development does not proceed then it is likely that the extant planning permission on the lands (Kildare County Council File Number 16/658; ABP Reference PL09.249038) will be implemented. In such circumstances the likely impacts will be similar to the impacts identified for the subject development.

### 12.3.7 Interactions

There is a potential for interaction as a result of the impacts of Waste Management on the following environmental topics:

- Roads and Traffic
- Hydrology and Water;
- Landscape and Visual;

# 13. INTERACTIONS

## 13.1 Introduction

Schedule 6 Item 2(d) of the Planning and Development Regulations, 2001 as amended requires that projects are examined with regard to the inter-relationship of aspects referred to in Item 2(d) of Schedule 6.

## 13.2 Principal Interactions

The likely significant adverse effects of the project are summarised below on a Chapter-by-Chapter basis taking into consideration the principal interactions between the environmental factors.

The assessment on significant effects includes, where relevant, cumulative effects i.e. the addition of many minor or significant effects and the effects of other projects.

### *13.2.1 Population and Human Health*

All environmental factors interact with Population and Human Health (Chapter 4). The key areas of interactions are:-

- Air and Climate
- Noise and Vibration
- Material Assets: Transportation
- Landscape

There are no significant adverse effects for Population and Human Health.

### *13.2.2 Biodiversity*

Impacts on Biodiversity are addressed in Chapter 4. Potential impacts relating to water quality and the aquatic environment during both the construction and operation phases are identified. There are also interactions with Human Health, Air Quality, Noise and Material Assets. Interactions with the following chapters are therefore relevant:

- Population & Human Health
- Water & Hydrology
- Noise & Vibration
- Air Quality & Climate
- Material Assets

Subject to the adherence to the recommended mitigation measures, no significant adverse impacts are anticipated.

### 13.2.3 Land, Soils & Geology

There is a potential for interaction between Land, Soils and Geology and the following environmental topics:

- Hydrology and Water;
- Noise and Vibration;
- Landscape and Visual;
- Archaeology;

Subject to the adherence to the recommended mitigation measures, no significant adverse impacts are anticipated.

### 13.2.4 Water & Hydrology

Effects on Water & Hydrology (Chapter 7) interact particularly with the following Chapters:-

- Biodiversity
- Land, Soils & Geology
- Material Assets (Built Services)

Subject to the adherence to the recommended mitigation measures, no significant adverse impacts are anticipated.

### 13.2.5 Air Quality and Climate

Air Quality and Climate (Chapter 8) issues have the potential to interact with the following environmental factors:

- Population and Human Health
- Biodiversity
- Land, Soils & Geology

Subject to the adherence to the recommended mitigation measures, no significant adverse impacts are anticipated.

### 13.2.6 Noise and Vibration

The effects associated with Noise and Vibration (Chapter 9) interact with the following Chapters:

- Population and Human Health
- Biodiversity
- Material Assets (Roads & Traffic)

Subject to the adherence to the recommended mitigation measures, no significant adverse impacts are anticipated.

### *13.2.7 Landscape & Visual Impact*

In terms of interactions, the impact on the landscape relates to many of the impact areas considered. In the current context, the most significant interactions are considered in the following Chapters:

- Population & Human Health
- Biodiversity

Subject to the adherence to the recommended mitigation measures, no significant adverse impacts are anticipated.

### *13.2.8 Cultural Heritage*

No significant interactions are identified. Subject to the adherence to the recommended mitigation measures, no significant adverse impacts are anticipated.

### *13.2.9 Material Assets*

There is a potential for interaction as a result of the impacts of Built Services on the following environmental topics:

- Land, Soils and Geology;
- Hydrology and Water;
- Waste management;

There is a potential for interaction as a result of the impacts of Roads and Traffic on the following environmental topics:

- Population and Human Health;
- Land, Soils and Geology;
- Air Quality;
- Noise and Vibration;

There is a potential for interaction as a result of the impacts of Waste Management on the following environmental topics:

- Roads and Traffic
- Hydrology and Water;
- Landscape and Visual;

Subject to the adherence to the recommended mitigation measures, no significant adverse impacts are anticipated.

## 13.3 Other Effects

Schedule 6 Item 2(e) of the Planning and Development Regulations, 2001 as amended requires that an EIAR contains a description of the likely significant effects (including direct, indirect, secondary, cumulative, transboundary, short, medium and long-term, permanent and temporary, positive and negative) of the project on the environment resulting from the following:-

- *the Use of Natural Resources*

No likely significant effects on the environment are expected to arise from the use of
natural resources in the construction / operation of the project

- *the emission of pollutants, the creation of nuisances and the disposal and recovery of waste.*

No likely significant effects on the environment are expected to arise from the emission of pollutants, the creation of nuisances or the elimination of waste associated with this project.

- *the risks to human health, cultural heritage or the environment (for example due to accidents or disasters)*

No significant impacts are expected on human health, cultural heritage or the environment as a result of the risk or vulnerability to major accidents or disasters.

- *The technologies and the substances used.*

This is an urban residential development and there are no technologies or substances associated with the project which would adversely affect the environment.

# 14. PRINCIPAL MITIGATION & MONITORING

## 14.1 Introduction

The *EPA Guidelines* note that *"for ease of reference and clarity and to facilitate enforcement, all such measures contained in an EIAR can be included in a compendium of mitigation and monitoring commitments (only). This may be a separate section or Appendix to the EIAR. Such a compendium should comprise a list of relevant measures but should not elaborate on the reasoning or expected effectiveness of those measures as the elaboration will take place within the main body of the EIAR".*

Tables 14.1 and 14.2 provide a summary of the mitigation and monitoring measures contained in Chapters 4 to 12 of the EIAR.

**Table 14.1 Construction Phase**

| | |
|---|---|
| **Population & Human Health** | • In order to mitigate potential temporary community disturbance during construction, an *Outline Construction Management Plan* (OCMP) has been prepared and is included with the application. If the project is approved and implemented, the appointed contractor will incorporate the environmental commitments contained in this EIAR and prepare a detailed *Construction Management Plan* for the agreement of the Planning Authority prior to development commencing on site.<br>• Prior to the commencement of the works on site the contractor will prepare a detailed *Construction Traffic Management Plan* and agree the related proposals with the Planning Authority.<br>• The contractor will appoint a Liaison Officer to ensure that any issues from the local community are dealt with promptly and efficiently during construction. These details will be included in the Contractor's CMP prepared prior to construction commencing.<br>• Typically, construction working hours will be limited to 8.00 – 19.00 Monday to Friday and 8.00 to 14.00 on Saturday. It is anticipated that there will be times, due to exceptional circumstances, that construction work will be necessary outside these standard hours i.e. large concrete pours. Deviations from these standard times will be agreed in advance with the Planning Authority.<br>• Measures to mitigate dust emissions and air pollution will be carried out as outlined in Chapter 8 of the EIAR.<br>• In order to sufficiently reduce the likely noise and vibration impact, a schedule of noise control |

| | |
|---|---|
| | measures has been formulated for the construction phase of the proposed development as outlined in Chapter 9. |
| **Biodiversity** | Terrestrial Biodiversity Protection Protocol<br>As a matter of standard construction practice, the development would be constructed in accordance with the following methods and guidelines:<br>• All construction works would be confined as far as possible to the development footprint;<br>• Where possible, vegetation removal works would be scheduled outside of the 1st of March to the 31st of August period, so as not to disturb nesting bird species;<br>• If works should take place beside any trees that will remain as part of the landscape plan, then a buffer zone of 2m would be applied onsite where possible;<br>• A tree arborist report has been prepared in conjunction with this report and all recemented measures to protect trees should be taken and implemented;<br>• The construction works contractor would take cognisance of the NRA's document "*Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes*", 2006. In particular, the construction works contractor would take cognisance of the guidelines with regards soakaway, sewage system and percolation area and the determination of the root protection area of the existing trees to be retained along the boundary of the proposed dwelling;<br>• A Landscape Plan will be prepared as part of the development and will take into consideration the urban setting and the use of native species where possible;<br>• All planting of trees and hedges to be undertaken during bare root season November to April. The balance of tree planting and lawn seeding to be completed within 12 months of the completion of construction work of the development.<br><br>Badger<br>• Mitigation measures should be put in place regard for *Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes (NRA 2006).*<br>• The building site should be made safe for mammals with hazards such as open holes/excavations covered over or fitted with ramps to allow for escape. Guidelines on both active and inactive sets |

must be followed:

- “The destruction of a successfully evacuated badger sett may only be conducted under the supervision of qualified and experienced personnel under licence from the NPWS. The possibility of badgers remaining within a sett must always be considered; suitable equipment should be available on hand to deal with badgers within the sett or any badgers injured during sett destruction”
- A metal fence will be installed along the boundary of the mature treeline that will limit access to the site for large mammals such as Badger. This will also prevent any construction work from imposing on the treeline and disturbing any Badgers within this area.
- Where possible, no construction works would be conducted outside of normal working hours, to reduce potential noise disturbance to nocturnal species.
- Should a Badger be found during the construction phase of the project, an officer of the NPWS would be notified prior to the resumption of construction works.

<u>Bats</u>

Artificial Lighting during construction phase;

- Construction works in the hours of darkness, when bats are active (April – October), would be kept to a minimum;
- Lighting of hedgerows / treelines would be avoided where possible;
- Should lighting be required during construction works, it would be of a low height (without compromising safe working conditions) to ensure minimal light spill. Where possible and where practicable to do so, timers or motion sensors would be used;
- Directional lighting would be used where possible, by use of louvres or shields fitted to the lighting;
- White light emitting diode (LED) would be used where possible, which is considered to be low impact in comparison to other lighting types

<u>Invasive Species</u>

The following controls for the prevention / treatment of invasive flora species would be implemented throughout the construction phase of the development:

- Regular site inspections would be undertaken to ensure that no growth of invasive species has taken place;
- The construction works contractor would ensure that all equipment and plant is inspected for the presence of invasive species and thoroughly washed prior to arriving to, and leaving from, the development site;
- All relevant construction personnel would be trained in invasive flora species (main species of concern) identification and control measures;
- In the unlikely event of an invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 appearing onsite, works within the immediate vicinity would cease until the invasive plant has been appropriately treated and disposed of to a suitably licenced facility, in accordance with Regulation 49 of the 2011 Regulations;
- Cognisance would be taken of the National Roads Authority’s Guidelines on “*The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads*”.

Aquatic Ecology

- The following mitigation measures would be proposed to ensure there is no significant impact upon the aquatic ecology of the area owing to a deterioration in water quality:
- The construction works contractor would adhere to standard construction best practice, taking cognisance of the Construction Industry Research and Information Association (CIRIA) guidelines “Control of Water Pollution from Construction Sites; guidance for consultants and contractors” 2001 and “Control of Water Pollution from Construction Sites – Guide to Good Practice”, 2002;
- Excavations and earth-moving activities would be planned outside periods of heavy rainfall, to limit the potential for suspended solids to become entrained within surface water run-off;
- Silt fencing would be placed around spoil areas until such time as the excavated soil has been used in landscaping / re-instatement works;
- Where possible, surface water run-off would be diverted from areas of bare / exposed ground;
- The use of pre-cast concrete where possible;

| | |
|---|---|
| | • The delivery and pouring of concrete would be supervised;<br>• All plant machinery and equipment would be maintained in good working order and regularly inspected;<br>• The re-fuelling of machinery would not take place within the immediate vicinity of watercourses, including drainage ditches;<br>• Spill kits, adequately stocked with spill clean-up materials such as booms and absorbent pads, would be available onsite;<br>  • In the unlikely event of a hydrocarbon spillage, contaminated spill clean-up material would be properly disposed of to an authorised waste contractor;<br>  • Cognisance should be taken of Inland Fisheries Ireland's "*Guidelines on Protection of Fisheries During Construction Works in and adjacent to Waters*"; |
| **Land, Soil & Geology** | • Should soils become contaminated during the construction phase of the proposed development these soils will be stockpiled onsite, sampled, and tested against the waste acceptance criteria as set out in the appropriate National directives and such soils will be disposed of to a suitable receiving facility.<br>• During the construction phase of the proposed development all appropriate measures will be taken to protect the geology of the site. Where possible an area will be left intact until construction is ready to begin. Stripping of the existing soils will not be undertaken until absolutely necessary to avoid any uncontrolled surface water runoff.<br>• The potential pollution of the ground during the construction phase will be mitigated by the provision of appropriate controls and working methods including:-<br>  • All excavations and related groundworks will be undertaken using best practice methods and the following principles will be followed<br>  • Excavations will be kept to the minimum required taking cognisance of the construction methods and health and safety requirements;<br>  • Construction equipment and support vehicles will travel only on designated roads and other approved access routes;<br>  • Ground disturbance will be kept to a minimum;<br>  • Material stockpiles will be stored in designated locations and soil stockpiles lightly |

| | |
|---|---|
| | compacted at the end of the working day;<br>- Surface water runoff from stockpiles will be intercepted via the construction site drainage plan to avoid direct discharge into the surface water system;<br>- Excavated subsoils will be reused as fill on site where possible. Any remaining volumes of unsuitable materials will be transported to the closest suitably licensed facility to be processed and reused in other construction projects in the vicinity, where possible. |
| **Hydrology & Water** | The following is an outline of the procedures which will be implemented in relation to the protection of the existing surface water networks during the construction phase of the project.<br>- Identify the location of all streams, watercourses, stormwater drains and drainage paths for surface water and how the proposed works will affect them by undertaking an appropriate pre-works survey (desk-based and on-site verification);<br>- A construction site drainage plan will be drawn up. Silt traps and settlement ponds will be established in appropriate locations of the site to treat run-off during construction prior to discharge. These will be inspected and maintained during construction;<br>- Run off from the construction site will be monitored;<br>- Designated impermeable concrete wash out areas will be established, maintained and the contents disposed of in an appropriate manner;<br>- All fuels and chemicals will be stored in bunded areas;<br>- Refuelling will take place in designated bunded areas;<br>- Identify potential sources of pollution;<br>- A method of disposing of contaminated water will be established in accordance with the requirements of the Environment Section of the Local Authority;<br>- In addition to the foregoing, the guidance provided in CIRIA C532 Control of Water Pollution from Construction Sites will be generally followed. |
| **Air Quality & Climate** | <u>Generation of Dust</u><br>- In order to mitigate dust emissions during the construction phase, a number of dust control measures have been included as part of the *Construction Management Plan* which has previously |

been prepared for the proposed development site. These dust control measures will be agreed with Kildare County Council (as part of Construction Management Plan).

- The following dust control measures should be implemented on-site, for the control and reduction of dust and fine particulate emissions (PM10).

    - Daily checks should be carried out on any operating mitigation equipment, exposed surfaces, stockpiles and public roads,
    - A temporary wheel-wash facility should be installed close to the location of the site entrance, to prevent the hauling of silt and mud onto the local road surface by vehicles departing from the site.
    - Exposed surfaces and entrances to the site should be dampened during dry windy conditions in the interest of controlling fugitive dust.
    - Bulk fine-sized aggregates and other similar building materials that may easily become airborne by the wind should not be stored in uncovered stockpiles.
    - Any spillage of material from vehicles departing the site should be promptly removed to prevent re-suspension of silt from the road surface by passing vehicles.
    - Stockpiles and dust generating activities should, in so far as is possible, be located away from sensitive receptors and upwind areas,
    - Dust control measures should be implemented on equipment used for drilling, pavement cutting, grinding of block surfaces and similar types of stone finishing, as significant fine particulate emissions can be generated which may cause a local nuisance.
    - Truck speeds will be controlled within the development area to prevent high levels of dust being re-suspended from the construction area.
    - Vehicles and plant machinery operating on-site will be properly maintained to prevent excessive emissions of particulates and other pollutants from the exhaust pipes.
    - Where necessary, protective hoarding screens should be erected around construction activities, to reduce dust-blow from the site, in particular where the sensitive receptors are in close proximity.

*Construction Traffic Emissions*

| | |
|---|---|
| | Mitigation measures to minimise related traffic emissions include:<br>- Ensure regular maintenance of plant and equipment. Technical inspection of vehicles to ensure they perform most efficiently.<br>- All site vehicles and machinery will be switched off when not in use (i.e. no idling).<br><u>Monitoring</u><br>- It is recommended that monthly dust deposition survey be carried out along the boundary of the proposed site in order to monitor the effectiveness of dust management for the duration of the construction phase. The TA Luft (German Government *Technical Instruction on Air Quality)* states a guideline of 350mg/m$^2$/day for the deposition of non-hazardous dusts. This value should not be exceeded beyond the site boundary and any breaches will require a review of operations and dust mitigation measures. |
| **Noise & Vibration** | With regards to construction activities, reference is made to BS5228: Noise Controls on Construction and Open Sites, which contains detailed guidance on the control of noise and vibration from demolition and construction activities. The following is a list of mitigation measures, which should be adhered to during the construction phase:<br>- Limiting the hours during which site activities likely to create high levels of noise or vibration are permitted; Normal working hours will be 0800-1900 hours Monday to Friday and 0800-1400 hours on Saturdays. Sunday working will be avoided but may be necessary on some occasions. When working outside of normal hours is required the contractor will discuss such requirements with Kildare County Council.,<br>- Channels of communication between the developer, contractor, local authority and community should be established,<br>- A site representative responsible for matters relating to noise should be appointed,<br>- It is recommended that annual monitoring while critical construction operations are occurring is completed to ensure that guidance levels are not exceeded at nearby sensitive receptors as a result of construction activities from the proposed development. |

| | |
|---|---|
| | - All on-site construction roads should be maintained to prevent banging and vibration noise from traffic,<br>- Plant with low inherent potential to generate noise and vibration will be used on-site,<br>- Activities with the potential to create noise should be scheduled so as not to be carried out simultaneously,<br>- Noise/acoustic barriers should be erected between noise sensitive location and noise sources.<br><br>Monitoring<br>- It is recommended that monthly noise monitoring be carried out along the boundary of the proposed site in order to monitor the effectiveness of noise management for the duration of the construction phase. Noise levels at noise sensitive locations should not exceed 70 dB(A) during weekdays and 65 dB(A) during Saturdays as per NRA guidance. These levels should not be exceeded, and any breach would require a review of operations. Noise mitigation measures should be put in place to ameliorate any exceedance which may be due to on-site construction work.<br>- Should complaints arise, it is recommended that noise monitoring be carried out at sensitive receptors during the construction phase of the proposed development, to ensure guideline limits are not exceeded and to determine whether further mitigation measures are required.<br>- Vibration measurements should be carried out where it is anticipated that guidance levels will be exceeded to ensure that no adverse effects occur to nearby sensitive receptors. |
| **Landscape & Visual Impact** | ***Avoidance Measures***<br>- Retention and protection of existing mature vegetation where possible on the western boundary. Existing trees to be retained and protected during construction stage in accordance with recommendation form the Arboriculture Assessment.<br>- Unsafe trees and hedgerow to be removed to allow for development and installation of proposed link road, greenway/ cycle path under the direction of the arborist.<br>- Avoidance of condense development and overshadowing by buildings on surrounding landscape features. |

| | |
|---|---|
| | ***Reduction Measures***<br>The building site and its associated compound, scaffolding and security fencing will be visible during construction. This is temporary, and unavoidable in all circumstances. Mitigation at this stage is primarily through site management procedures, such as:<br>• Vehicles exiting the site during construction stage shall be subject to wheel wash facilities or road sweepers shall be used to maintain clean roads.<br>• Any lighting used during construction process should be kept to a minimum, providing for site safety only, and shall be directed into the site and away from adjacent residential properties and roads.<br>• Disturbance of existing vegetation will be minimised where possible. Proposed planting will help integrate the proposed development into the surrounding landscape, providing screening where needed, reflect vegetation patterns of local habitats, and minimise the effect on the landscape character of the area. |
| **Cultural Heritage** | Archaeology<br>• Prior to the commencement of any development works in the northern area of the site (i.e., the area not previously disturbed by extractive works), a buffer area of 5m should be established around the extent of the archaeological cluster (F1 – F11). The extent of this buffer zone is illustrated in Figure 11.14 above and should be established by the erection of a post-and-wire fence. No construction materials, including spoil, should be stored, and no temporary structures (e.g., offices etc.) should be sited, within the buffer area; likewise, no construction vehicles should enter the buffer area.<br>• No trees should be planted within the extent of the archaeological buffer zone indicated in Figure 11.14. However, shallow-rooted plants are permissible but should not be positioned over the immediate locations of the subsurface archaeological features, the extents of which are indicated in Figure 11.13. |

| | |
|---|---|
| | - Removal of any soil from the spoil mounds located in the northern area of the site should only be done onto the ground surface level of the undisturbed lands to the immediate north. The existing buried topsoil horizon should not be disturbed.<br>- All topsoil/ploughsoil stripping onto the surface of the underlying subsoil layers/horizons in the northern area of the site, as indicated in Figure 11.15, should be monitored by an archaeologist and under licence to the Department of Culture, Heritage and the Gaeltacht. In particular, such works associated with the construction corridor associated with the link road within this area, which is scheduled to commence in the immediate future, should be monitored.<br>- In the event of additional subsurface features being uncovered during the course of such monitoring, works in the immediate area of such features should cease and the advice of the National Monuments should be sought to determine what additional action should be implemented.<br>- In the event that the cluster of archaeological features uncovered by the two programmes of archaeological investigations cannot be preserved *in-situ* by the existing or future development, then a programme of full archaeological excavation (preservation by record) and associated post-excavation programme will be required, funded by the developer and subject to approval with the National Monuments Service, Department of Housing, Local Government & Heritage. |
| **Material Assets** | Built Services<br>- During the construction phase of the proposed development, it will be necessary for the contractor to implement measures to mitigate potential impacts arising from the installation of the proposed underground service networks. These measures are set out in the Outline Construction Management Plan.<br><br>Roads & Traffic<br>- Prior to the commencement of the works on site the contractor will prepare a detailed Construction Traffic Management Plan and agree the related proposals with the Planning Authority and An Garda Síochána based on the measures set out in the Outline Construction |

| | |
|---|---|
| | Management Plan.<br>• Given the location and nature of access to the site, site parking or construction parking will be located on the site<br>• Construction vehicle movements will be minimised by the adoption of measures including:<br>  • Consolidation of delivery loads to/from the site and managing large deliveries on site to occur outside of peak periods;<br>  • Use of precast/prefabricated materials where possible;<br>  • Provision of adequate storage space on the site;<br>  • Development of a strategy to minimise construction material quantities insofar as possible;<br>  • Construction staff vehicle movements will also be minimised by promoting, where feasible, the use of public transport and car sharing;<br><u>Waste Management</u><br>• The following mitigation measures will be implemented during the construction phase of the proposed development:<br>  • Building materials will be chosen with an aim to ‘design out waste’<br>  • On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery<br>  • Left over materials (e.g., timber off-cuts, broken concrete blocks/bricks) and any suitable construction materials shall be re-used on-site, where possible;<br>  • All waste materials will be stored in skips or other suitable receptacles in designated areas of the site;<br>  • Any hazardous wastes generated will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required);<br>  • The main contractor will appoint a waste manager to ensure effective management of waste during the excavation and construction works;<br>  • All construction staff will be provided with training regarding the waste management procedures;<br>  • All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licenced facilities; and |

| | |
|---|---|
| | • All waste leaving the site will be recorded and copies of relevant documentation maintained. |

**Table 14.2 Operational Phase**

| | |
|---|---|
| **Population & Human Health** | • Mitigation measures relating to those factors under which population and human health effects might occur have been addressed elsewhere in this EIAR, under the relevant environmental factors. Other than the mitigation measures outlined these Chapters, no further mitigation measures have been proposed with respect to population and human health for the operational phase. |
| **Biodiversity** | Bats<br>The lighting design for the proposed development would be finalised at the detailed design stage. The lighting design would take cognisance of the following mitigation measures:<br>• Lighting would be directed to where it is required only;<br>• Lighting of hedgerows / treelines would be avoided where possible;<br>• Buildings, carparks and site entrance lighting would be angled away from hedgerows and treelines;<br>• Lighting would be of low height where possible, to minimise light spill;<br>• Where possible and practicable to do so, timers or motion sensors would be used;<br>• White LED or amber coloured LED outdoor lighting would be used where possible, which is considered to be low impact in comparison to other lighting types. |
| **Land, Soil & Geology** | • The proposed development includes the provision of surface water attenuation and soakaways in a number of open space locations using proprietary geocellular storage units.<br>• Bypass petrol interceptors will be fitted upstream of all soakaway and attenuation storage facilities and the surface water inflow pipes will incorporate catchpit manholes. It is proposed that the |

| | |
|---|---|
| | soakaways and geocellular attenuation storage facilities will be wrapped with a Permafilter Geotextile which will retain any oil contamination which escapes capture. |
| **Hydrology & Water** | • The mitigation measures to be implemented during the operational phase of the proposed development will include the implementation of proper operation and maintenance regimes for the surface water drainage system in accordance with the recommendations of CIRIA 753, The SuDS Manual, to reduce the risk of human or mechanical error causing a pluvial flood risk from blockages, etc. |
| **Air Quality & Climate** | • It is considered that the operational phase of the development will not have a significant negative impact on the local air quality. No project-specific mitigation measures are proposed. |
| **Noise & Vibration** | • It is not anticipated that there will be any adverse noise impacts on nearby sensitive receptors as a result of the operational phase of the proposed development, due to the nature of the activities which will be occurring there. |
| **Landscape & Visual Impact** | • Enhancement of site tree cover by introduction of additional tree and woodland planting.<br>• Provide a permeable design by creating connections to other amenities, such as the proposed link road and its associated pedestrian/ cycle path.<br>• Landscape works to be carried out as per associated landscape layout.<br>• Appropriate new native species to be used throughout the scheme<br>• Landscape management and maintenance to be drawn up and approved by qualified professional.<br>• Ensure that all ongoing landscape maintenance and debris cleaning is carried out during the operational period within the site: and<br>• Ensure that ongoing maintenance and replacement of failing or failed plant material. |
| **Cultural Heritage** | • No mitigation or monitoring measures are required at operational stage |
| **Material Assets** | <u>Built Services</u> |

- As part of the operational phase of the proposed development smart metering should be installed to allow future occupants of the proposed development to measure energy use.

Roads & Traffic

- Mobility management will be a key part of the proposed development strategy to encourage occupiers to use sustainable means of transport. This will include the appointment of a Mobility Manager who will be involved in monitoring the modes of travel of the occupants of the proposed development and this ideally will be done on an annual basis. The mobility manager will at the outset of the occupation of the development implement a number of key measures. These will include:
    - Providing new residents with a Travel Welcome Pack providing full details of transport options, cycle/walking maps and information on local services;
    - Induction sessions for new households and follow up visits;
    - Instigate and regularly update a centrally located travel notice board providing travel information;

Waste Management

- During the operational phase, a structured approach to waste management as set out above will promote resource efficiency and waste minimisation. Provided the mitigation measures are implemented and a high rate of reuse, recycling and recovery is achieved, the predicted impact of the operational phase on the environment will be long-term, neutral and imperceptible.

# Appendix 6.1 Geotechnical Ground Investigations

# Ballymany Newbridge – Ground Investigation

| | |
|---|---|
| Client: | Anthony Neville Homes Ltd. |
| Client's Representative: | Muir Associates Limited (MAL) |
| Report No.: | 18-1301 |
| Date: | December 2018 |
| Status: | Final for Issue |

**Causeway Geotech Ltd**
8 Drumahiskey Road, Ballymoney
Co. Antrim, N. Ireland, BT53 7QL

+44 (0)28 2766 6640
info@causewaygeotech.com
www.causewaygeotech.com

Registered in Northern Ireland. Company Number: NI610766
Approved: ISO 9001 • ISO 14001 • OHSAS 18001

## CONTENTS

## APPENDICES

## Document Control Sheet

<table>
<tr><td colspan="2"><b>Report No.:</b></td><td colspan="4">18-1301</td></tr>
<tr><td colspan="2"><b>Project Title:</b></td><td colspan="4">Ballymany Newbridge</td></tr>
<tr><td colspan="2"><b>Client:</b></td><td colspan="4">Anthony Neville Homes Ltd.</td></tr>
<tr><td colspan="2"><b>Client’s Representative:</b></td><td colspan="4">Muir Associates Limited (MAL)</td></tr>
<tr><td><b>Revision:</b></td><td>A00</td><td><b>Status:</b></td><td>Final for Issue</td><td><b>Issue Date:</b></td><td>07 December 2018</td></tr>
<tr><td colspan="2"><b>Prepared by:</b></td><td colspan="2"><b>Reviewed by:</b></td><td colspan="2"><b>Approved by:</b></td></tr>
<tr><td colspan="2">Sean Ross<br>BSc MSc</td><td colspan="2">Darren O’Mahony<br>BSc MSc MIEI</td><td colspan="2">Darren O’Mahony<br>BSc MSc MIEI</td></tr>
</table>

The works were conducted in accordance with:

British Standards Institute (2015) BS 5930:2015, Code of practice for site investigations.

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

Laboratory testing was conducted in accordance with:

British Standards Institute BS 1377:1990 parts 2, 4, 5, 7 and 9

# METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015, The Code of Practice for Site Investigation.

| **Abbreviations used on exploratory hole logs** | |
|---|---|
| U | Nominal 100mm diameter undisturbed open tube sample (thick walled sampler) |
| UT | Nominal 100mm diameter undisturbed open tube sample (thin walled sampler) |
| P | Nominal 100mm diameter undisturbed piston sample |
| B | Bulk disturbed sample |
| LB | Large bulk disturbed sample |
| D | Small disturbed sample |
| C | Core sub-sample (displayed in the Field Records column on the logs) |
| L | Liner sample from dynamic sampled borehole |
| W | Water sample |
| ES / EW | Soil sample for environmental testing / Water sample for environmental testing |
| SPT (s) | Standard penetration test using a split spoon sampler (small disturbed sample obtained) |
| SPT (c) | Standard penetration test using 60 degree solid cone |
| x,x/x,x,x,x | Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length.<br>The length achieved is stated (mm) for any test increment less than 75mm |
| N=X | SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm) |
| N=X/Z | Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given test length 'Z' (mm) |
| V<br>VR | Shear vane test (borehole) Hand vane test (trial pit) Shear strength stated in kPa<br>V: undisturbed vane shear strength VR: remoulded vane shear strength |
| dd/mm/yy: 1.0<br>dd/mm/yy: dry | Date & water level at the borehole depth at the end of shift and the start of the following shift |
| ▽ | Water strike: initial depth of strike |
| ▼ | Water strike: depth water rose to |
| Abbreviations relating to rock core – reference Clause 36.4.4 of BS 5930: 2015 | |
| TCR (%) | Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run. |
| SCR (%) | Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures. |
| RQD (%) | Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run. |
| FI | Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing. |
| NI | Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles. |
| AZCL | Assessed zone of core loss: The estimated depth range where core was not recovered. |
| DIF | Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring. |
| (xxx/xxx/xxx) | Spacing between discontinuities (minimum/average/maximum). |

## Ballymany Newbridge

## 1 AUTHORITY

On the instructions of Muir Associates Limited (MAL), ("the Client's Representative"), acting on the behalf of Anthony Neville Homes Ltd. ("the Client"), a ground investigation was undertaken at the above location to provide geotechnical and environmental information for input to the design and construction of a proposed residential development.

This report details the work carried out both on site and in the geotechnical and chemical testing laboratories; it contains a description of the site and the works undertaken, the exploratory hole logs and the laboratory test results. A discussion on the recommendations for construction is also provided.

All information given in this report is based upon the ground conditions encountered during the site investigation works, and on the results of the laboratory and field tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

This report was prepared by Causeway Geotech Ltd for the use of the Client and the Client's Representative in response to a particular set of instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

## 2 SCOPE

The extent of the investigation, as instructed by the Client's Representative, included boreholes, soil sampling, environmental sampling, in-situ and laboratory testing, and the preparation of a report on the findings including recommendations for construction.

## 3 DESCRIPTION OF SITE

As shown on the site location plan in Appendix A, the works were conducted on the site of a disused gravel quarry off the R445 in Ballymany south west of Newbridge, Kildare. The site is located opposite a Maxol car garage. The northern section of the site is an agricultural field, with the gravel quarry comprising 60% of the site.

# 4 SITE OPERATIONS

## 4.1 Summary of site works

Site operations, which were conducted between 12th and 14th November 2018, comprised:

- six light cable percussion boreholes.

The exploratory holes and in-situ tests were located as instructed by the Client's Representative, as shown on the exploratory hole location plan in Appendix A.

## 4.2 Boreholes

Six boreholes (BH01-BH06) were put down to completion in minimum 200mm diameter using a Dando 2000 light cable percussion boring rig. All boreholes were terminated either at their scheduled completion depths, or else on encountering virtual refusal on obstructions or very dense deposits.

Hand dug inspection pits were carried out between ground level and 1.20m depth to ensure boreholes were put down at locations clear of services or subsurface obstructions.

Disturbed (bulk and small bag) samples were taken within the encountered strata. Undisturbed samples were not taken due to the granular nature of the strata encountered. Environmental samples were taken at standard intervals of 0.5 and 1.0m.

Standard penetration tests were carried out in accordance with BS EN 22476-3: 2005 at standard depth intervals using the split spoon sampler ($SPT_{(s)}$) or solid cone attachment ($SPT_{(c)}$). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix E.

Any water strikes encountered during boring were recorded along with any changes in their levels as the borehole proceeded.

Where water was added to assist with boring, a note has been added to the log to account for same.

Appendix B presents the borehole logs.

## 4.3 Standpipe installations

A groundwater monitoring standpipe was installed in boreholes BH04.

Details of the installations, including the depth range of the response zone, are provided in Appendix B on the individual borehole logs.

## 4.4 Surveying

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Trimble R6 GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (Irish National Grid) and ground elevation (mOD Malin) at each location are recorded on the individual exploratory hole logs. The exploratory hole plan presented in Appendix A shows these as-built positions.

# 5 LABORATORY WORK

Upon their receipt in the laboratory, all disturbed samples were carefully examined and accurately described, and their descriptions incorporated into the borehole logs.

## 5.1 Geotechnical laboratory testing of soils

Laboratory testing of soils comprised:

- **soil classification:** moisture content measurement, Atterberg Limit tests and particle size distribution analysis.
- **soil chemistry:** water-soluble sulphate content

Laboratory testing of soils samples was carried out in accordance with British Standards Institute:
*BS 1377, Methods of test for soils for civil engineering purposes; Part 1 (2016), and Parts 2-9 (1990).*

The test results are presented in Appendix C.

## 5.2 Environmental laboratory testing of soils

Environmental testing was conducted on selected environmental soil samples by Chemtest at its laboratory in Newmarket, Suffolk.

Testing was carried out according to Suite I of the Engineers Ireland Specification for Ground Investigation (2016) which includes testing for a range of determinants, including:

- Metals

- Speciated total petroleum hydrocarbons (TPH)
- Speciated polycyclic aromatic hydrocarbons (PAH)
- Cyanides
- Asbestos screen
- pH.

Waste acceptance criteria (WAC) testing was carried out on two samples.

Results of environmental laboratory testing are presented in Appendix D.

# 6 GROUND CONDITIONS

## 6.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise glacial sands and gravels. These deposits are underlain by cherty limestones of the Rickardstown Formation.

## 6.2 Ground types encountered during investigation of the site

A summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

- **Fluvioglacial deposits:** typically, medium dense sands and gravels with localised pockets of firm to stiff sandy gravelly clays interspersed throughout.

- **Glacial till:** sandy gravelly clay/silt, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth.

## 6.3 Groundwater

Groundwater was encountered during percussion boring soil as water strikes as shown in Table 1 below.

**Table 1 Groundwater strikes encountered during the ground investigation**

| GI Ref | Water Level (mbgl) | Comments |
|---|---|---|
| BH01 | 2.20 | Rose to 2.10 after 15 mins |
| BH01 | 5.70 | Rose to 5.00 after 10 mins |
| BH02 | 3.80 | Rose to 3.80 after 20 mins |

| | | |
|---|---|---|
| BH02 | 6.20 | Rose to 6.00 after 15 mins |
| BH03 | 3.10 | Rose to 3.00 after 15 mins |
| BH03 | 6.50 | Rose to 6.00 after 20 mins |
| BH04 | 1.90 | Rose to 1.80 after 20 mins |
| BH04 | 5.80 | Rose to 5.50 after 15 mins |
| BH05 | 3.10 | Rose to 3.10 after 20 mins |
| BH05 | 6.80 | Rose to 6.50 after 20 mins |
| BH06 | 3.10 | Rose to 2.80 after 15 mins |
| BH06 | 6.80 | Rose to 6.50 after 20 mins |

Details of the individual groundwater strikes, along with any relative changes in levels as works proceeded, are presented on the exploratory hole logs for each location.

It should be noted that the casing used in supporting the borehole walls during drilling may have sealed out additional groundwater strikes and the possibility of encountering groundwater during excavation works should not be ruled out.

Seasonal variation in groundwater levels should also be factored into design considerations. Continued monitoring of the installed standpipe will give an indication of the seasonal variation in groundwater level.

# 7 DISCUSSION

## 7.1 Proposed construction

It is proposed to construct a new residential development in the site.

No further details were available to Causeway Geotech at the time of preparing this report and any designs based on the recommendations or conclusions within this report should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory holes. Causeway Geotech were commissioned to provide a geotechnical report, and it is outwith our remit to advise on structure design.

## 7.2 Recommendations for construction

### 7.2.1 Summary

Based on the presence of dense to very dense sands and gravels at relatively shallow depths across the footprint of the proposed building, the implementation of traditional shallow (spread) foundations (strip/pad and trench fill) are considered suitable.

### 7.2.2 Soil strength parameters

For granular soils (sand/gravel), a graphical relationship between SPT “N” value and angle of shearing resistance, φ, has been developed by Peck, Hanson and Thorburn. This is published in *Foundation Design and Construction* (Tomlinson, 2001) and is referenced in this report when deriving angles of shearing resistance for the gravel soils.

### 7.2.3 Bearing resistance

The ultimate bearing resistance for conventional strip or pad foundations can be obtained from Brinch Hansen’s general equation:

$$q_n = cN_c s_c d_c l_c b_c + p_o N_q s_q d_q l_q b_q + \frac{1}{2}\gamma B N_\gamma s_\gamma d_\gamma l_\gamma b_\gamma$$

(Equation 1)

where:

$q_n$ = ultimate bearing resistance
c = undrained cohesion of soil
B = foundation width
$p_o$ = effective overburden pressure at foundation level
Nc, Nq, Nγ = bearing capacity factors
$s_c$, $s_q$, $s_\gamma$ = shape factors
$d_c$, $d_q$, $d_\gamma$ = depth factors
$l_c$, $l_q$, $l_\gamma$ = load inclination factors
$b_c$, $b_q$, $b_\gamma$ = base inclination factors

For conventional strip and pad foundations constructed on fine soils, the general equation has been simplified by Terzaghi to:

Net ultimate bearing resistance = $cN_c$

(Equation 2)

where:

c = undrained cohesion
$N_c$ = bearing capacity factor

For cohesionless soils (sand/gravel, c=0), the calculation of ultimate bearing resistance is generally required only for loose sands. This is because coarser gravel soils would not be expected to suffer a bearing capacity failure. However, limits are placed on the allowable bearing resistance in order to control settlement. For shallow conventional pad foundations on granular soils, Terzaghi’s simplified equation can be used as follows:

$$q_n = p_o(N_q - 1) + 0.4BN + p \qquad \text{(Equation 3)}$$

where:

$p$ = total overburden pressure

It is obvious from the equations 1 to 3 that some knowledge of the foundation width and depth is required before the ultimate bearing resistance can be calculated.

Table 3 provides an indication of minimum founding depth at each borehole location. Also shown are approximate soil strengths based on the Stroud and Butler (1975) correlations with SPT N-values and visual examination of recovered samples of the clay deposits.

The table also suggests allowable bearing resistance using Equations 2 and 3 for cohesive and cohesionless soils respectively.

This table does not take into account the variations in soil composition, and the effects of differential movement within a particular structure. Calculation of the design bearing resistance over the entire structure will entail a knowledge of the magnitude and distribution of the structural actions.

### 7.2.4 Foundations and ground floor construction

Foundations should transfer loading to below any Made Ground or subsoil. The recommended foundation construction and allowable bearing pressure (ABP) at the borehole locations are presented in Table 2.

**Table 2: Construction recommendations**

| Borehole | Depth below EGL* to suitable bearing stratum | Estimated ABP (kPa) | Strata description | Foundation type | Ground floor construction | Groundwater |
|---|---|---|---|---|---|---|
| BH01 | 2.00m | >250 | Stiff GLACIAL TILL | Strip & pad | Suspended | Strike at 2.20mbgl |
| BH02 | 2.00m | >250 | Dense SAND | Strip & pad | Suspended | Strike at 3.80mbgl |
| BH03 | 2.00m | >250 | Dense GRAVEL | Strip & pad | Suspended | Strike at 3.10mbgl |
| BH04 | 1.20m | 200 | Stiff GLACIAL TILL | Strip & pad | Suspended | Strike at 1.90mbgl |
| BH05 | 1.20m | 200 | Medium dense GRAVEL | Strip & pad | Suspended | Strike at 3.10mbgl |

| Borehole | Depth below EGL* to suitable bearing stratum | Estimated ABP (kPa) | Strata description | Foundation type | Ground floor construction | Groundwater |
|---|---|---|---|---|---|---|
| BH06 | 2.00m | 200 | Stiff GLACIAL TILL | Strip & pad | Suspended | Strike at 3.10mbgl |

*Existing Ground Level

Based on the findings of the site investigation, spread foundations (strip/pad) are considered suitable with estimated allowable bearing pressures of 200kPa to greater than250kPa at depths between 1.20m and 2.00m on medium dense to dense glacial sands and gravels.

The base of foundation excavations should be thoroughly inspected; any loose/soft soils should be removed with the resultant void backfilled with ST1 concrete or engineered fill. A consistent bearing stratum should be provided for any building unit to limit differential settlements.

Given the generally coarse-grained nature of the soils throughout the proposed formation levels, excavations for foundations have the potential to be unstable. However, any instability can be minimised by battering the side slopes at 2 vertical to 1 horizontal and by limiting the duration that the excavation is open. Groundwater control is likely to be required where excavations are at or below 2.00m, will be possible by pumping from sumps formed in the base of excavations.

### 7.2.5 Floor slabs

Floor slabs should not bear directly onto Made Ground or loose/soft soils. Therefore, the use of ground bearing floor slabs is only appropriate following the removal of any surface Made Ground and soft clay layers and their replacement using well-graded well-compacted granular fill. However, a suspended floor slab should be adopted where the difference in levels of the proposed floor and the base of Made Ground/soft soils is greater than 600mm.

### 7.2.6 Excavations for services

For the installation of services ducts/trenches, it is suggested that open trenching will be the most practicable construction method. Generally speaking, the ground conditions should render the use of open trenching by backhoe excavator possible, with some local trench support likely due to the granular nature of the material.

Where working in open trenches, it is thought that trench support systems, by way of a trench box, will be required to maintain trench stability and safe working conditions. Groundwater control at these locations should be possible by means of sump pumping.

To preclude the eventuality of differential settlements in pipes, they should be laid on a consistent stratum of appropriate allowable bearing capacity and protected with appropriate fill cover.

Where ducts and chambers must be installed in areas where localised soft spots are encountered, the use of geogrid reinforcement along the base of the very soft/soft soil (e.g. peat) below the trench base is recommended. This will stiffen the base of the trench and help control longitudinal differential settlement.

Backfilling of trenches may be completed by using compacted Cl 804 granular fill and reinstated as appropriate.

### 7.2.7 Soil aggressivity

An assessment of the Aggressive Chemical Environment for Concrete (ACEC) was undertaken through reference to the Building Research Establishment (BRE) Special Digest 1 (2017).

As noted by BRE Special Digest 1, sulphates in the soil and groundwater are the chemical agents most likely to attack concrete. The extent to which sulphates affect concrete is linked to their concentrations, the type of ground, the presence of groundwater, the type of concrete and the form of construction in which concrete is used.

BRE Special Digest 1 identifies four different categories of site which require specific procedures for investigation for aggressive ground conditions:

- Sites not subjected to previous industrial development and not perceived as containing pyrite;
- Sites not subjected to previous industrial development and perceived as containing pyrite;
- Brownfield sites not perceived as containing pyrite;
- Brownfield sites perceived as containing pyrite.

For the purposes of this report the site was classified as having been subject to previous industrial development and not perceived as containing pyrite.

The results of chemical tests (pH and water soluble sulphate contents) on soil samples indicate Design Sulphate Class DS-1 and ACEC Class AC-1 – reference Table C1 of BRE Special Digest 1 (Building Research Establishment, 2005). The Special Digest does not require any measures to protect underground concrete elements greater that 140mm thick.

## 7.3 Site contamination and waste disposal

Selected soil samples were analysed for a range of potential contaminants including:

- Metals;
- Speciated total petroleum hydrocarbons (TPH);

- Speciated polycyclic aromatic hydrocarbons (PAH);
- Cyanides;
- Sulphates and sulphide;
- Phenols; and
- Asbestos screening

Select samples were also tested for a Waste Acceptance Criteria (WAC) suite to assess the potential categorisation of waste from the site.

In the initial examination of the potential risk of site contamination, the laboratory results have been compared to the LQM/CIEH S4UL's assessment criteria relevant to the proposed land use:

The results from the tested samples do not identify significantly elevated concentrations above the available S4UL's.

It should be noted that the above assessment is based on the results of the soil samples against available S4UL's and this assessment has not been undertaken following the CLR11 guidelines. Any potential contamination identified during site development by visual or olfactory means should be investigated, including further laboratory testing, and appropriate health & safety, waste disposal and remediation measures adopted.

In assessment of the waste acceptance criteria (WAC) results, the test results have been compared with the European Union Directive limits for Inert waste landfill, Stable, Non-reactive hazardous waste in non-hazardous landfill and hazardous waste landfill criteria. From the samples tested for WAC analysis material from the site may potentially be classified as inert/non-hazardous. Any material excavated for off-site disposal would have to be classified under the guidance in the National Hazardous Waste Management Plan (EPA, 2014)

## 8 REFERENCES

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

IS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

BS 1377: 1990: Methods of test for soils for civil engineering purposes. British Standards Institution.

BS 5930: 2015: Code of practice for ground investigations. British Standards Institution.

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. British Standards Institution.

BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description.

BS EN ISO 14688-2:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.

BS EN ISO 22476-3:2005+A1:2011: Geotechnical investigation and testing. Field testing. Standard penetration test.

Building Research Establishment (2005) BRE Special Digest 1, Concrete in aggressive ground.

Contaminated Land Report (CLR) 11, (2009) Model Procedures for the Management of Land Contamination, The Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency.

CAUSEWAY GEOTECH

# APPENDIX A

# SITE AND EXPLORATORY HOLE LOCATION PLANS

| | | | |
|---|---|---|---|
| **Project No.:** | 18-1301 | **Client:** | Anthony Neville Homes Ltd |
| **Project Name:** | Ballymany, Newbridge, Co. Kildare | **Client's Representative:** | Muir Associates Limited (MAL) |

Legend Key

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

**Title:**

Site Location Plan

| **Last Revised:** | **Scale:** |
|---|---|
| 28/11/2018 | 1:20000 |

CAUSEWAY GEOTECH

**Project No.:** 18-1301

**Project Name:** Ballymany, Newbridge, Co. Kildare

**Client:** Anthony Neville Homes Ltd

**Client's Representative:** Muir Associates Limited (MAL)

Legend Key

● Locations By Type - CP

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

**Title:**

## Exploratory Hole Location Plan

**Last Revised:** 28/11/2018

**Scale:** 1:5000

# APPENDIX B

# BOREHOLE LOGS

**CAUSEWAY GEOTECH**

**Project No.:** 18-1301

**Project Name:** Ballymany, Newbridge, Co. Kildare

**Borehole No.:** BH01

Sheet 1 of 2

**Coordinates:** 279147.60 E 213707.00 N

**Client:** Anthony Neville Homes Ltd

**Client's Representative:** Muir Associates Limited (MAL)

**Scale:** 1:50

**Driller:** SS

**Logger:** SR

**Ground Level:** 105.34 mOD

**Dates:** 12/11/2018 - 12/11/2018

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 10.20 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Loose becoming medium dense brown sandy subrounded fine to medium GRAVEL with low cobble content. Sand is fine to coarse. Cobbles are subrounded. | | |
| 0.50 | D1<br>ES21 | | | | | | | | | |
| 0.80 - 1.20 | B11 | | | | | | | | | |
| 1.00 | ES22 | | | | | (1.80) | | | | |
| 1.20 - 1.65 | SPT (S)<br>N=15 | 0.00 | Dry | N=15 (3,3/4,4,3,4) | | | | | | |
| 1.50 | D2 | | | | | | | | | |
| 1.80 - 2.20 | B12 | | | | 103.54 | 1.80 | | Very stiff slightly sandy very silty CLAY. Sand is fine to medium. | | |
| 2.00 - 2.45 | SPT (S)<br>N=37 | 2.00 | 1.10 | N=37 (4,7/7,9,10,11)<br>Water Strike at 2.20m | | | | | | |
| 2.50 | D3 | | | | | | | | | |
| 2.80 - 3.20 | B13 | | | | | | | | | |
| 3.00 - 3.45 | SPT (S)<br>N=40 | 3.00 | 2.50 | N=40 (9,8/8,9,11,12) | | (2.80) | | | | |
| 3.50 | D4 | | | | | | | | | |
| 3.80 - 4.20 | B14 | | | | | | | | | |
| 4.00 - 4.45 | SPT (S)<br>N=40 | 4.00 | 3.00 | N=40 (9,8/8,9,11,12) | | | | | | |
| 4.50 | D5 | | | | | | | | | |
| | | | | | 100.74 | 4.60 | | Very dense slightly gravelly silty brown fine to coarse SAND. | | |
| 4.80 - 5.20 | B15 | | | | | | | | | |
| 5.00 - 5.21 | SPT (S) | 5.00 | 4.10 | N=50 (19,14/50 for 60mm) | | | | | | |
| 5.50 | D6 | | | | | | | | | |
| | | | | Water Strike at 5.70m | | | | | | |
| 5.80 - 6.20 | B16 | | | | | (2.90) | | | | |
| 6.50 | D7 | | | | | | | | | |
| 6.50 - 6.76 | SPT (C) | 6.50 | 5.10 | N=50 (8,12/50 for 106mm) | | | | | | |
| 6.80 - 7.20 | B17 | | | | | | | | | |
| 7.50 | D8 | | | | 97.84 | 7.50 | | Very dense brown sandy silty subrounded fine to coarse GRAVEL with low cobble content. Sand is fine to coarse. Cobbles are subrounded. | | |
| 7.80 - 8.20 | B18 | | | | | | | | | |
| 8.00 - 8.23 | SPT (C) | 8.00 | 6.00 | N=50 (14,11/50 for 82mm) | | (1.30) | | | | |
| 8.50 | D9 | | | | | | | | | |
| 8.80 - 9.20 | B19 | | | | 96.54 | 8.80 | | Very dense brown sandy subrounded fine to medium GRAVEL with medium cobble content. Sand is fine to coarse. Cobbles are subrounded. | | |
| | | | | | | (1.40) | | | | |
| 9.50 | D10 | | | | | | | | | |
| 9.50 - 9.68 | SPT (C) | 9.60 | Dry | N=50 (44 for 140mm/50 for 44mm) | | | | | | |

**Remarks**

Hand dug inspection pit excavated to 1.20m.

Terminated at scheduled depth.

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| 2.20 | 2.20 | 15 | 2.10 |
| 5.70 | 5.70 | 10 | 5.00 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.20 | 10.20 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 10.00 | 200 |

**CAUSEWAY**
GEOTECH

| | | |
|---|---|---|
| **Project No.:** 18-1301 | **Project Name:** Ballymany, Newbridge, Co. Kildare | **Borehole No.:** **BH01** |
| **Coordinates:** 279147.60 E<br>213707.00 N | **Client:** Anthony Neville Homes Ltd | Sheet 2 of 2 |
| | **Client's Representative:** Muir Associates Limited (MAL) | **Scale:** 1:50 |
| **Ground Level:** 105.34 mOD | **Dates:** 12/11/2018 - 12/11/2018 | **Driller:** SS<br>**Logger:** SR |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 10.20 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| 9.80 - 10.20 | B20 | | | | | | | Very dense brown sandy subrounded fine to medium GRAVEL with medium cobble content. Sand is fine to coarse. Cobbles are subrounded. | | |
| 10.00 - 10.12 | SPT (C) | 10.00 | Dry | N=50 (25 for 66mm/50 for 52mm) | 95.14 | 10.20 | | | | |
| | | 10.00 | Dry | 12-11-2018 | | | | End of Borehole at 10.20m | | |

10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5

**Remarks**
Hand dug inspection pit excavated to 1.20m.

Terminated at scheduled depth.

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.20 | 10.20 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 10.00 | 200 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 10.00 |

**Project No.:** 18-1301

**Project Name:** Ballymany, Newbridge, Co. Kildare

**Borehole No.:** BH02

**Coordinates:** 279209.20 E<br>213772.50 N

**Client:** Anthony Neville Homes Ltd

Sheet 1 of 2

**Client's Representative:** Muir Associates Limited (MAL)

**Scale:** 1:50

**Driller:** SS

**Ground Level:** 107.40 mOD

**Dates:** 13/11/2018 - 13/11/2018

**Logger:** SR

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | Brown very sandy subrounded fine to coarse GRAVEL with low cobble content. Sand is fine to coarse. Cobbles are subrounded. |
| 0.50 | D11<br>ES21 | | | | | (0.80) | |
| 0.80 - 1.20 | B1 | | | | 106.60 | 0.80 | Medium dense becoming dense brown slightly gravelly very silty fine to coarse SAND. Gravel is subrounded fine to medium. |
| 1.00 | ES22 | | | | | | |
| 1.20 - 1.65 | SPT (S)<br>N=19 | 0.00 | Dry | N=19 (4,3/4,4,5,6) | | | |
| 1.50 | D12 | | | | | | |
| 1.80 - 2.20 | B2 | | | | | | |
| 2.00 - 2.45 | SPT (S)<br>N=33 | 2.00 | 1.50 | N=33 (5,4/5,9,8,11) | | | |
| 2.50 | D13 | | | | | | |
| 2.80 - 3.20 | B3 | | | | | (4.00) | |
| 3.00 - 3.45 | SPT (S)<br>N=27 | 3.00 | 2.10 | N=27 (4,5/6,6,7,8) | | | |
| 3.50 | D14 | | | | | | |
| 3.80 - 4.20 | B4 | | | | | | |
| | | | | Water Strike at 3.80m | | | |
| 4.00 - 4.45 | SPT (S)<br>N=36 | 4.00 | 3.00 | N=36 (8,8/8,9,10,9) | | | |
| 4.50 | D15 | | | | | | |
| 4.80 - 5.20 | B5 | | | | 102.60 | 4.80 | Very stiff brown slightly sandy clayey SILT. Sand is fine to medium. |
| 5.00 - 5.24 | SPT (S) | 5.00 | 3.50 | N=50 (16,17/50 for 90mm) | | | |
| | | | | | | (1.00) | |
| 5.50 | D16 | | | | | | |
| 5.80 - 6.20 | B6 | | | | 101.60 | 5.80 | Very stiff brown slightly gravelly sandy slightly clayey SILT. Sand is fine to coarse. Gravel is fine. |
| | | | | Water Strike at 6.20m | | | |
| 6.50 | D17 | | | | | (1.40) | |
| 6.50 - 6.78 | SPT (C) | 6.50 | 5.10 | N=50 (13,12/50 for 130mm) | | | |
| 6.80 - 7.20 | B7 | | | | | | |
| | | | | | 100.20 | 7.20 | Very dense brown sandy subrounded fine to coarse GRAVEL with medium cobble content. Sand is fine to coarse. Cobbles are subrounded. |
| 7.50 | D18 | | | | | | |
| 7.80 - 8.20 | B8 | | | | | | |
| 8.00 - 8.36 | SPT (C) | 8.00 | 6.30 | N=50 (10,13/50 for 210mm) | | | |
| 8.50 | D19 | | | | | | |
| | | | | | | (2.80) | |
| 8.80 - 9.20 | B9 | | | | | | |
| 9.50 | D20 | | | | | | |
| 9.50 - 9.78 | SPT (C) | 9.50 | 5.10 | N=50 (8,13/50 for 126mm) | | | |
| 9.80 - 10.20 | B10 | | | | 97.40 | 10.00 | |

**Remarks**

Hand dug inspection pit excavated to 1.20m.

Terminated at scheduled depth.

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| 3.80 | 3.80 | 20 | 3.00 |
| 6.20 | 6.00 | 15 | 6.00 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.20 | 10.00 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 10.00 | 200 |

**CAUSEWAY GEOTECH**

| Project No.: | Project Name: | Borehole No.: |
|---|---|---|
| 18-1301 | Ballymany, Newbridge, Co. Kildare | BH02 |
| **Coordinates:** | **Client:** | Sheet 2 of 2 |
| 279209.20 E | Anthony Neville Homes Ltd | **Scale:** 1:50 |
| 213772.50 N | **Client's Representative:** Muir Associates Limited (MAL) | **Driller:** SS |
| **Ground Level:** 107.40 mOD | **Dates:** 13/11/2018 - 13/11/2018 | **Logger:** SR |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 10.00 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| 10.00 - 10.19 | SPT (C) | 10.00 | 8.90 | N=50 (43 for 145mm/50 for 45mm) | | | | End of Borehole at 10.00m | | |
| | | 10.00 | 6.80 | 13-11-2018 | | | | | | |

10.5
11.0
11.5
12.0
12.5
13.0
13.5
14.0
14.5
15.0
15.5
16.0
16.5
17.0
17.5
18.0
18.5
19.0
19.5

**Remarks**
Hand dug inspection pit excavated to 1.20m.

Terminated at scheduled depth.

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.20 | 10.00 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 10.00 | 200 |

| | | | |
|---|---|---|---|
| **Project No.:**<br>18-1301 | **Project Name:**<br>Ballymany, Newbridge, Co. Kildare | | **Borehole No.:**<br>**BH03** |
| **Coordinates:**<br>279074.80 E<br>213795.30 N | **Client:**<br>Anthony Neville Homes Ltd | | Sheet 1 of 2 |
| | **Client's Representative:**<br>Muir Associates Limited (MAL) | | **Scale:** 1:50 |
| | | | **Driller:** SS |
| **Ground Level:**<br>103.77 mOD | **Dates:**<br>13/11/2018 - 13/11/2018 | | **Logger:** SR |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 10.20 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Medium dense becoming dense brown sandy very silty subrounded fine to medium GRAVEL. Sand is fine to coarse. | | |
| 0.50 | D1 | | | | | | | | | |
| 0.80 - 1.20 | B11 | | | | | | | | | |
| 1.20 - 1.65 | SPT (S)<br>N=15 | 0.00 | | N=15 (3,3/4,4,3,4) | | (2.30) | | | | |
| 1.50 | D2 | | | | | | | | | |
| 1.80 - 2.20 | B12 | | | | | | | | | |
| 2.00 - 2.45 | SPT (S)<br>N=33 | 2.00 | | N=33 (8,7/7,8,9,9) | | | | | | |
| | | | | | 101.47 | 2.30 | | Very stiff brown slightly sandy slightly gravelly very silty CLAY. Sand is fine to medium. Gravel is subrounded and fine. | | |
| 2.50 | D3 | | | | | | | | | |
| 2.80 - 3.20 | B13 | | | | | | | | | |
| 3.00 - 3.45 | SPT (S)<br>N=34 | 3.00 | | N=34 (4,8/8,8,9,9)<br>Water Strike at 3.10m | | | | | | |
| 3.50 | D4 | | | | | | | | | |
| 3.80 - 4.20 | B14 | | | | | | | | | |
| 4.00 - 4.45 | SPT (S)<br>N=34 | 4.00 | | N=34 (6,6/7,8,9,10) | | | | | | |
| 4.50 | D5 | | | | | | | | | |
| 4.80 - 5.20 | B15 | | | | | | | | | |
| 5.00 - 5.45 | SPT (S)<br>N=39 | 5.00 | | N=39 (9,9/8,10,11,10) | | | | | | |
| 5.50 | D6 | | | | | | | | | |
| 5.80 - 6.20 | B16 | | | | | | | | | |
| | | | | | | (7.90) | | | | |
| 6.50 | D7 | | | | | | | | | |
| 6.50 - 6.72 | SPT (C) | 6.50 | | N=50 (18,17/50 for 75mm)<br>Water Strike at 6.50m | | | | | | |
| 6.80 - 7.20 | B17 | | | | | | | | | |
| 7.50 | D8 | | | | | | | | | |
| 7.80 - 8.20 | B18 | | | | | | | | | |
| 8.00 - 8.32 | SPT (C) | 8.00 | | N=50 (13,14/50 for 170mm) | | | | | | |
| 8.50 | D9 | | | | | | | | | |
| 8.80 - 9.20 | B19 | | | | | | | | | |
| 9.50 | D10 | | | | | | | | | |
| 9.50 - 9.70 | SPT (C) | 9.50 | | N=50 (18,19/50 for 55mm) | | | | | | |
| 9.80 - 10.20 | B20 | | | | | | | | | |

**Remarks**

Hand dug inspection pit excavated to 1.20m.

Terminated at scheduled depth.

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| 3.10 | 3.10 | 15 | 3.00 |
| 6.50 | 6.50 | 20 | 6.00 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.20 | 6.00 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 10.20 | 200 |

CAUSEWAY GEOTECH

| | | | | |
|---|---|---|---|---|
| **Project No.:**<br>18-1301 | **Project Name:**<br>Ballymany, Newbridge, Co. Kildare | | | **Borehole No.:**<br>**BH03** |
| **Coordinates:**<br>279074.80 E<br>213795.30 N | **Client:**<br>Anthony Neville Homes Ltd | | | Sheet 2 of 2 |
| | **Client's Representative:**<br>Muir Associates Limited (MAL) | | | **Scale:** 1:50 |
| **Ground Level:**<br>103.77 mOD | **Dates:**<br>13/11/2018 - 13/11/2018 | | | **Driller:** SS<br>**Logger:** SR |

| **Method** | **Plant Used** | **Top** | **Base** |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 10.20 |

| **Depth (m)** | **Sample / Tests** | **Casing Depth (m)** | **Water Depth (m)** | **Field Records** | **Level (mOD)** | **Depth (m) (Thickness)** | **Legend** | **Description** | **Water** | **Backfill** |
|---|---|---|---|---|---|---|---|---|---|---|
| 10.00 - 10.18 | SPT (C) | 10.00<br>10.20 | | N=50 (19,19/50 for 30mm)<br>13-11-2018 | 93.57 | 10.20 | | Very stiff brown slightly sandy slightly gravelly very silty CLAY. Sand is fine to medium. Gravel is subrounded and fine. | | |
| | | | | | | | | End of Borehole at 10.20m | | |

10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5

**Remarks**

Hand dug inspection pit excavated to 1.20m.

Terminated at scheduled depth.

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.20 | 6.00 |

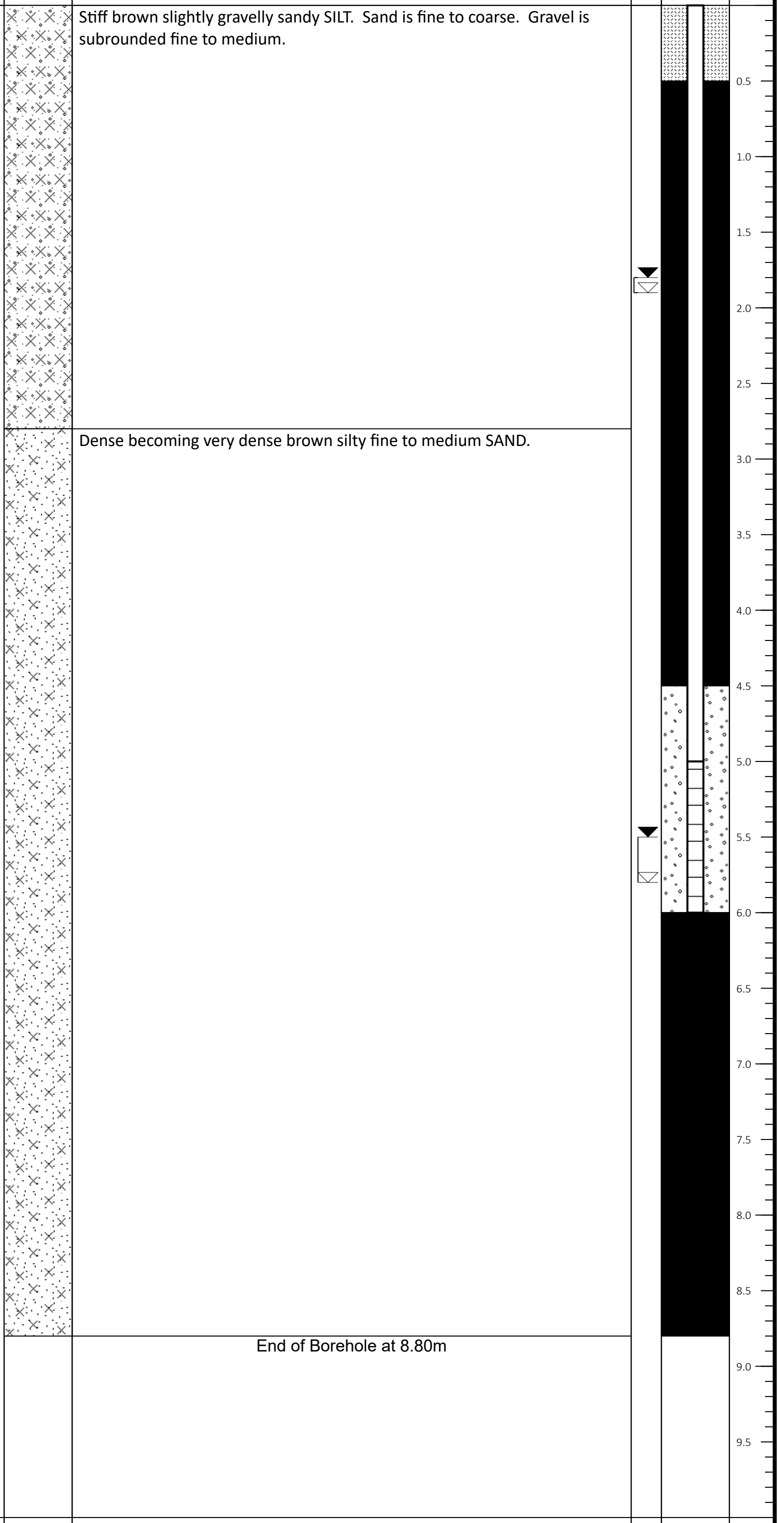
**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 10.20 | 200 |

| | | | | |
|---|---|---|---|---|
| **Project No.:**<br>18-1301 | **Project Name:**<br>Ballymany, Newbridge, Co. Kildare | | | **Borehole No.:**<br>**BH04** |
| **Coordinates:**<br>279193.60 E<br>213865.50 N | **Client:**<br>Anthony Neville Homes Ltd | | | Sheet 1 of 1 |
| | **Client's Representative:**<br>Muir Associates Limited (MAL) | | | **Scale:** 1:50 |
| **Ground Level:**<br>105.15 mOD | **Dates:**<br>14/11/2018 - 14/11/2018 | | | **Driller:** SS<br>**Logger:** SR |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 8.80 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Stiff brown slightly gravelly sandy SILT. Sand is fine to coarse. Gravel is subrounded fine to medium. | | |
| 0.50 | D1<br>ES19 | | | | | | | | | |
| 0.80 - 1.20 | B10 | | | | | | | | | |
| 1.00 | ES20 | | | | | | | | | |
| 1.20 - 1.65 | SPT (S)<br>N=22 | 0.00 | Dry | N=22 (3,3/4,4,6,8) | | | | | | |
| 1.50 | D2 | | | | | (2.80) | | | | |
| 1.80 - 2.20 | B11 | | | | | | | | | |
| | | | | Water Strike at 1.90m | | | | | | |
| 2.00 - 2.45 | SPT (S)<br>N=26 | 2.00 | 1.80 | N=26 (4,4/5,6,7,8) | | | | | | |
| 2.50 | D3 | | | | | | | | | |
| 2.80 - 3.20 | B12 | | | | 102.35 | 2.80 | | Dense becoming very dense brown silty fine to medium SAND. | | |
| 3.00 - 3.45 | SPT (S)<br>N=35 | 3.00 | 2.80 | N=35 (6,5/8,9,9,9) | | | | | | |
| 3.50 | D4 | | | | | | | | | |
| 3.80 - 4.20 | B13 | | | | | | | | | |
| 4.00 - 4.45 | SPT (S)<br>N=42 | 4.00 | 3.30 | N=42 (5,8/8,11,11,12) | | | | | | |
| 4.50 | D5 | | | | | | | | | |
| 4.80 - 5.20 | B14 | | | | | | | | | |
| 5.00 - 5.45 | SPT (S)<br>N=40 | 5.00 | 4.10 | N=40 (6,6/7,8,13,12) | | | | | | |
| 5.50 | D6 | | | | | | | | | |
| 5.80 - 6.20 | B15 | | | | | (6.00) | | | | |
| | | | | Water Strike at 5.80m | | | | | | |
| 6.50 | D7 | | | | | | | | | |
| 6.50 - 6.94 | SPT (C) | 6.50 | 5.10 | N=50 (10,10/50 for 295mm) | | | | | | |
| 6.80 - 7.20 | B16 | | | | | | | | | |
| 7.50 | D8 | | | | | | | | | |
| 7.80 - 8.20 | B17 | | | | | | | | | |
| 8.00 - 8.15 | SPT (C) | 8.00 | 7.00 | N=50 (44 for 110mm/50 for 44mm) | | | | | | |
| 8.50 | D9 | | | | | | | | | |
| 8.80 | B18 | | | | 96.35 | 8.80 | | End of Borehole at 8.80m | | |
| 8.80 - 9.02 | SPT (C) | 8.80 | 7.30 | N=50 (13,14/50 for 74mm) | | | | | | |
| | | 8.80 | 6.90 | 14-11-2018 | | | | | | |



**Remarks**

Hand dug inspection pit excavated to 1.20m.

Terminated at scheduled depth.

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| 1.90 | 1.90 | 20 | 1.80 |
| 5.80 | 5.80 | 15 | 5.50 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.20 | 8.80 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 8.80 | 200 |

**CAUSEWAY GEOTECH**

| | | | |
|---|---|---|---|
| **Project No.:** 18-1301 | **Project Name:** Ballymany, Newbridge, Co. Kildare | **Borehole No.:** BH05 |
| **Coordinates:** 278977.10 E<br>213970.30 N | **Client:** Anthony Neville Homes Ltd | Sheet 1 of 2 |
| | **Client's Representative:** Muir Associates Limited (MAL) | **Scale:** 1:50<br>**Driller:** SS |
| **Ground Level:** 100.81 mOD | **Dates:** 14/11/2018 - 14/11/2018 | **Logger:** SR |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 10.20 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Medium dense becoming dense brown sandy slightly silty subrounded fine to coarse GRAVEL with low cobble content and occasional bands of silt. Sand is fine to coarse. | | |
| 0.50 | D1<br>ES19 | | | | | | | | | |
| 0.80 - 1.20 | B11 | | | | | | | | | |
| 1.00 | ES20 | | | | | | | | | |
| 1.20 - 1.65 | SPT (S)<br>N=21 | 0.00 | Dry | N=21 (3,4/5,5,6,5) | | | | | | |
| 1.50 | D2 | | | | | | | | | |
| 1.80 - 2.20 | B12 | | | | | | | | | |
| | | | | | | (4.60) | | | | |
| 2.50 | D3 | | | | | | | | | |
| 2.80 - 3.20 | B13 | | | | | | | | | |
| 3.00 - 3.45 | SPT (S)<br>N=32 | 3.00 | 2.10 | N=32 (8,8/9,7,7,9)<br>Water Strike at 3.10m | | | | | | |
| 3.50 | D4 | | | | | | | | | |
| 3.80 - 4.20 | B14 | | | | | | | | | |
| 4.00 - 4.45 | SPT (S)<br>N=34 | 4.00 | 3.00 | N=34 (6,8/9,9,8,8) | | | | | | |
| 4.50 | D5 | | | | | | | | | |
| | | | | | 96.21 | 4.60 | | Very stiff brown sandy SILT. Sand is fine to medium. | | |
| 4.80 - 5.20 | B15 | | | | | | | | | |
| 5.00 - 5.45 | SPT (S)<br>N=35 | 5.00 | 2.80 | N=35 (8,8/8,9,9,9) | | | | | | |
| 5.50 | D6 | | | | | | | | | |
| 6.50 | D7 | | | | | | | | | |
| 6.50 - 6.95 | SPT (C)<br>N=38 | 6.50 | 2.90 | N=38 (6,8/8,8,10,12) | | | | | | |
| 6.80 - 7.20 | B16 | | | Water Strike at 6.80 | | (4.70) | | | | |
| 7.50 | D8 | | | | | | | | | |
| 8.00 - 8.30 | SPT (C) | 8.00 | 3.10 | N=50 (14,13/50 for 145mm) | | | | | | |
| 8.50 | D9 | | | | | | | | | |
| 8.80 - 9.20 | B17 | | | | | | | | | |
| | | | | | 91.51 | 9.30 | | Very dense brown slightly sandy subrounded fine to coarse GRAVEL with high cobble content. Sand is fine to coarse. Cobbles are subrounded | | |
| 9.50 | D10 | | | | | | | | | |
| 9.50 - 9.58 | SPT (C) | 9.50 | 3.00 | N=50 (25 for 35mm/50 for 41mm) | | (0.90) | | | | |

**Remarks**

Hand dug inspection pit excavated to 1.20m.

Terminated at scheduled depth.

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| 3.10 | 3.10 | 20 | 3.00 |
| 6.80 | 6.50 | 20 | 6.50 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.20 | 10.20 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 10.20 | 200 |

| | | | | | |
|---|---|---|---|---|---|
| **Project No.:** 18-1301 | **Project Name:** Ballymany, Newbridge, Co. Kildare | | | | **Borehole No.:** BH05 |
| **Coordinates:** 278977.10 E<br>213970.30 N | **Client:** Anthony Neville Homes Ltd | | | | Sheet 2 of 2 |
| | **Client's Representative:** Muir Associates Limited (MAL) | | | | **Scale:** 1:50 |
| **Ground Level:** 100.81 mOD | **Dates:** 14/11/2018 - 14/11/2018 | | | | **Driller:** SS<br>**Logger:** SR |

| **Method** | **Plant Used** | **Top** | **Base** |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 10.20 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| 9.80 - 10.20 | B18 | | | | | | ⁘ | Very dense brown slightly sandy subrounded fine to coarse GRAVEL with high cobble content. Sand is fine to coarse. Cobbles are subrounded | | ⁘ |
| 10.00 - 10.20 | SPT (C) | 10.00 | 7.00 | N=50 (18,25/50 for 55mm) | 90.61 | 10.20 | | End of Borehole at 10.20m | | |
| | | 10.00 | 6.80 | 14-11-2018 | | | | | | |

**Remarks**
Hand dug inspection pit excavated to 1.20m.

Terminated at scheduled depth.

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.20 | 10.20 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 10.20 | 200 |

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:**<br>18-1301 | **Project Name:**<br>Ballymany, Newbridge, Co. Kildare | | **Borehole No.:**<br>**BH06** |
| **Coordinates:**<br>279100.50 E<br>214018.00 N | **Client:**<br>Anthony Neville Homes Ltd | | Sheet 1 of 1 |
| | **Client's Representative:**<br>Muir Associates Limited (MAL) | | **Scale:** 1:50 |
| **Ground Level:**<br>104.29 mOD | **Dates:**<br>14/11/2018 - 14/11/2018 | | **Driller:** SS<br>**Logger:** SR |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 8.40 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.50 | D1<br>ES18 | | | | | | | Medium dense brown sandy subrounded fine to coarse GRAVEL with low cobble content. Sand is fine to coarse. | | |
| 0.80 - 1.20 | B9 | | | | | (1.40) | | | | |
| 1.00 | ES19 | | | | | | | | | |
| 1.20 - 1.65 | SPT (S)<br>N=16 | 0.00 | Dry | N=16 (3,4/4,4,4,4) | | | | | | |
| 1.50 | D2 | | | | 102.89 | 1.40 | | Stiff brown slightly sandy slightly gravelly very silty CLAY. Sand is fine to coarse. Gravel is subrounded and fine. | | |
| 1.80 - 2.20 | B10 | | | | | | | | | |
| 2.00 - 2.45 | SPT (S)<br>N=22 | 2.00 | 1.50 | N=22 (3,4/5,6,6,5) | | (1.70) | | | | |
| 2.50 | D3 | | | | | | | | | |
| 2.80 - 3.20 | B11 | | | | | | | | | |
| 3.00 - 3.45 | SPT (S)<br>N=29 | 3.00 | 1.80 | N=29 (4,4/8,4,9,8)<br>Water Strike at 3.10m | 101.19 | 3.10 | | Stiff becoming very stiff slightly sandy SILT. Sand is fine to medium. | | |
| 3.50 | D4 | | | | | | | | | |
| 3.80 - 4.20 | B12 | | | | | | | | | |
| 4.00 - 4.45 | SPT (S)<br>N=32 | 4.00 | 3.00 | N=32 (5,5/6,8,8,10) | | | | | | |
| 4.50 | D5 | | | | | | | | | |
| 4.80 - 5.20 | B13 | | | | | | | | | |
| 5.00 - 5.45 | SPT (S)<br>N=47 | 5.00 | 3.90 | N=47 (8,9/8,13,12,14) | | | | | | |
| 5.50 | D6 | | | | | (4.50) | | | | |
| 5.80 - 6.20 | B14 | | | | | | | | | |
| 6.50 | D7 | | | | | | | | | |
| 6.50 - 6.64 | SPT (C) | 6.50 | 5.10 | N=50 (41 for 100mm/50 for 45mm) | | | | | | |
| 6.80 - 7.20 | B15 | | | Water Strike at 6.80m | | | | | | |
| 7.50 | D8 | | | | 96.69 | 7.60 | | Very dense brown slightly sandy subrounded fine to coarse GRAVEL with low cobble content. Sand is fine to coarse. Cobbles and boulders are subangular to subrounded. | | |
| 7.80 - 8.20 | B16 | | | | | | | | | |
| 8.00 - 8.20 | SPT (C) | 8.00 | 4.80 | N=50 (18,19/50 for 45mm) | | (0.80) | | | | |
| 8.40 | B17 | | | | 95.89 | 8.40 | | End of Borehole at 8.40m | | |
| 8.40 - 8.55 | SPT (C) | 8.40 | 5.10 | N=50 (48 for 105mm/50 for 41mm) | | | | | | |
| | | 8.40 | | 14-11-2018 | | | | | | |

**Remarks**

Hand dug inspection pit excavated to 1.20m.

Terminated on large boulder.

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| 3.10 | 3.10 | 15 | 2.80 |
| 6.80 | 6.80 | 20 | 6.50 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 8.00 | 8.40 | 01:00 |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.20 | 8.40 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 8.40 | 200 |

CAUSEWAY
GEOTECH

# APPENDIX C

# GEOTECHNICAL LABORATORY TEST RESULTS

CAUSEWAY GEOTECH

10122

+44 (0)28 2766 6640
info@causewaygeotech.com
www.causewaygeotech.com

# SOIL AND ROCK SAMPLE ANALYSIS
# LABORATORY TEST REPORT

| | |
|---|---|
| **Project Name:** | Ballymany, Newbridge, Co. Kildare |
| **Project No.:** | 18-1301 |
| **Client:** | Anthony Neville Homes Ltd |
| **Engineer:** | Muir Associates Limited (MAL) |
| **Date:** | 06/12/18 |

---

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s).

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Approved Signatory

Stephen Watson

Stephen Watson
Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

**Causeway Geotech Ltd**
8 Drumahiskey Road, Ballymoney
Co. Antrim, N. Ireland, BT53 7QL

Registered in Northern Ireland. Company Number: NI610766

**Project Name:** Ballymany, Newbridge, Co. Kildare

**Report Reference:** Schedule 1

The table below details the tests carried out, the specifications used, and the number of tests included in this report.

Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

| Material tested | Type of test/Properties measured/Range of measurement | Standard specifications | No. of results included in the report |
|---|---|---|---|
| SOIL | Moisture Content of Soil | BS 1377-2: 1990: Cl 3.2 | 17 |
| SOIL | Liquid and Plastic Limits of soil-1 point cone penetrometer method | BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4 | 15 |
| SOIL | Particle size distribution - wet sieving | BS 1377-2: 1990: Cl 9.2 | 16 |
| SOIL | Particle size distribution - sedimentation hydrometer method | BS 1377-2: 1990: Cl 9.5 | 14 |

## SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All sub-contracting laboratories used are UKAS accredited.

| Material tested | Type of test/Properties measured/Range of measurement | Standard specifications | No. of results included in the report |
|---|---|---|---|
| SOIL – Subcontracted to Pro Soils Limited *(UKAS 2183)* | pH Value of Soil | | 2 |

# Summary of Classification Test Results

| Project No. | Project Name |
|---|---|
| 18-1301 | Ballymany, Newbridge, Co. Kildare |

| Hole No. | Sample | | | | Soil Description | Density | | w | Passing 425µm | LL | PL | PI | Particle density | Casagrande Classification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ref | Top | Base | Type | | bulk | dry | | | | | | | |
| | | | | | | Mg/m3 | | % | % | % | % | % | Mg/m3 | |
| BH01 | 12 | 1.80 | | B | Brown slightly sandy silty CLAY. | | | 26.0 | 99 | 28 -1pt | 21 | 7 | | CL |
| BH01 | 15 | 4.80 | | B | Brown slightly silty fine to coarse SAND. | | | 19.0 | | | | | | |
| BH02 | 1 | 0.80 | | B | Brown slightly gravelly silty fine to coarse SAND. | | | 15.0 | | | | | | |
| BH02 | 5 | 4.80 | | B | Brown slightly sandy silty CLAY. | | | 27.0 | 97 | 28 -1pt | 20 | 8 | | CL |
| BH02 | 6 | 5.80 | | B | Brown slightly sandy silty CLAY. | | | 25.0 | 100 | 28 -1pt | 21 | 7 | | CL |
| BH03 | 11 | 0.80 | | B | Brown sandy slightly gravelly silty CLAY. | | | 24.0 | 75 | 28 -1pt | 17 | 11 | | CL |
| BH03 | 12 | 1.80 | | B | Brown silty fine to medium SAND. | | | 22.0 | 82 | 28 -1pt | NP | | | |
| BH03 | 14 | 3.80 | | B | Brown sandy silty CLAY. | | | 22.0 | 84 | 28 -1pt | 21 | 7 | | CL |
| BH03 | 16 | 5.80 | | B | Brown sandy silty CLAY. | | | 27.0 | 97 | 29 -1pt | 12 | 17 | | CL |
| BH03 | 18 | 7.80 | | B | Brown sandy SILT/CLAY. | | | 20.0 | 87 | 28 -1pt | 22 | 6 | | ML/CL |
| BH04 | 10 | 0.80 | | B | Brown sandy gravelly SILT/CLAY. | | | 11.0 | 74 | 25 -1pt | 19 | 6 | | ML/CL |
| BH04 | 12 | 2.80 | | B | Brown silty fine to medium SAND. | | | 23.0 | 100 | 28 -1pt | NP | | | |

All tests performed in accordance with BS1377:1990 unless specified otherwise

LAB 01R Version 4

Key

| | | |
|---|---|---|
| Density test | Liquid Limit | Particle density |
| Linear measurement unless : | 4pt cone unless : | sp - small pyknometer |
| wd - water displacement | cas - Casagrande method | gj - gas jar |
| wi - immersion in water | 1pt - single point test | |

Date Printed

12/06/2018 00:00

Approved By

Stephen.Watson

10122

# Summary of Classification Test Results

| Project No. | Project Name |
|---|---|
| 18-1301 | Ballymany, Newbridge, Co. Kildare |

| Hole No. | Sample |  |  |  | Soil Description | Density |  | w | Passing 425µm | LL | PL | PI | Particle density | Casagrande Classification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | Ref | Top | Base | Type |  | bulk | dry |  |  |  |  |  |  |  |
|  |  |  |  |  |  | Mg/m3 |  | % | % | % | % | % | Mg/m3 |  |
| BH04 | 13 | 3.80 |  | B | Brown silty fine SAND. |  |  | 21.0 | 99 | 29 -1pt | NP |  |  |  |
| BH05 | 12 | 1.80 |  | B | Brown slightly sandy subrounded fine to coarse GRAVEL. |  |  | 6.0 | 38 | 22 -1pt | 14 | 8 |  | CL |
| BH05 | 15 | 4.80 |  | B | Brown slightly sandy silty CLAY. |  |  | 26.0 | 98 | 31 -1pt | 19 | 12 |  | CL |
| BH06 | 10 | 1.80 |  | B | Brown slightly sandy silty CLAY. |  |  | 25.0 | 98 | 28 -1pt | 20 | 8 |  | CL |
| BH06 | 12 | 3.80 |  | B | Brown slightly sandy SILT. |  |  | 21.0 | 85 | 21 -1pt | 17 | 4 |  | ML |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

All tests performed in accordance with BS1377:1990 unless specified otherwise

LAB 01R Version 4

Key

| Density test | Liquid Limit | Particle density |
|---|---|---|
| Linear measurement unless : | 4pt cone unless : | sp - small pyknometer |
| wd - water displacement | cas - Casagrande method | gj - gas jar |
| wi - immersion in water | 1pt - single point test |  |

Date Printed

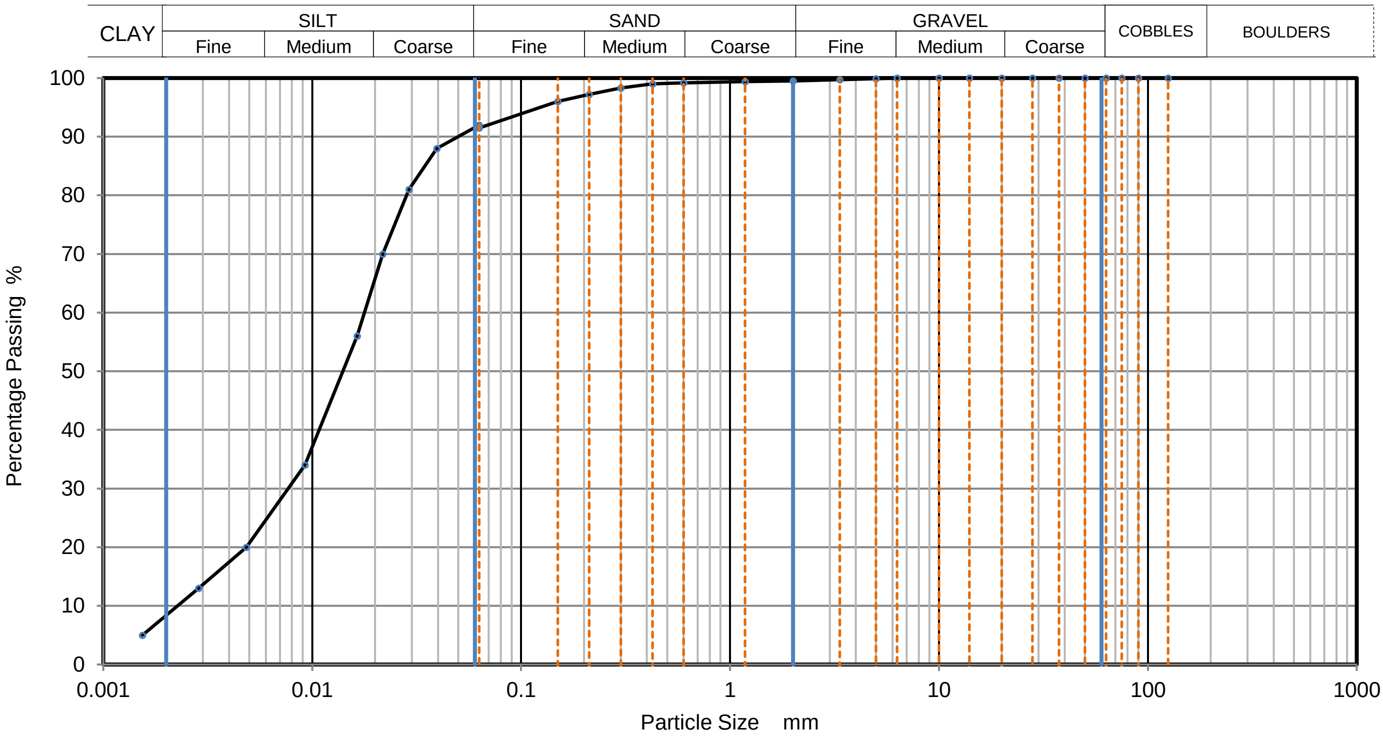
12/06/2018 00:00

Approved By

Stephen.Watson

10122

| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | Job Ref | **18-1301** |
|---|---|---|---|---|
| | | | Borehole/Pit No. | BH01 |
| Site Name | Ballymany, Newbridge, Co. Kildare | | Sample No. | 12 |
| Soil Description | Brown slightly sandy silty CLAY. | | Depth, m | 1.80 |
| Specimen Reference | 7 | Specimen Depth 1.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | KeyLAB ID | Caus2018112220 |



| **Sieving** | | **Sedimentation** | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 92 |
| 90 | 100 | 0.0395 | 88 |
| 75 | 100 | 0.0291 | 81 |
| 63 | 100 | 0.0217 | 70 |
| 50 | 100 | 0.0164 | 56 |
| 37.5 | 100 | 0.0092 | 34 |
| 28 | 100 | 0.0048 | 20 |
| 20 | 100 | 0.0029 | 13 |
| 14 | 100 | 0.0015 | 5 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 99 | | |
| 0.6 | 99 | Particle density | (assumed) |
| 0.425 | 99 | 2.65 | Mg/m3 |
| 0.3 | 98 | | |
| 0.212 | 97 | | |
| 0.15 | 96 | | |
| 0.063 | 92 | | |

| Dry Mass of sample, g | 1481 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 1 |
| Sand | 8 |
| Silt | 83 |
| Clay | 8 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.0179 |
| D30 | mm | 0.00768 |
| D10 | mm | 0.00229 |
| Uniformity Coefficient | | 7.8 |
| Curvature Coefficient | | 1.4 |

Remarks

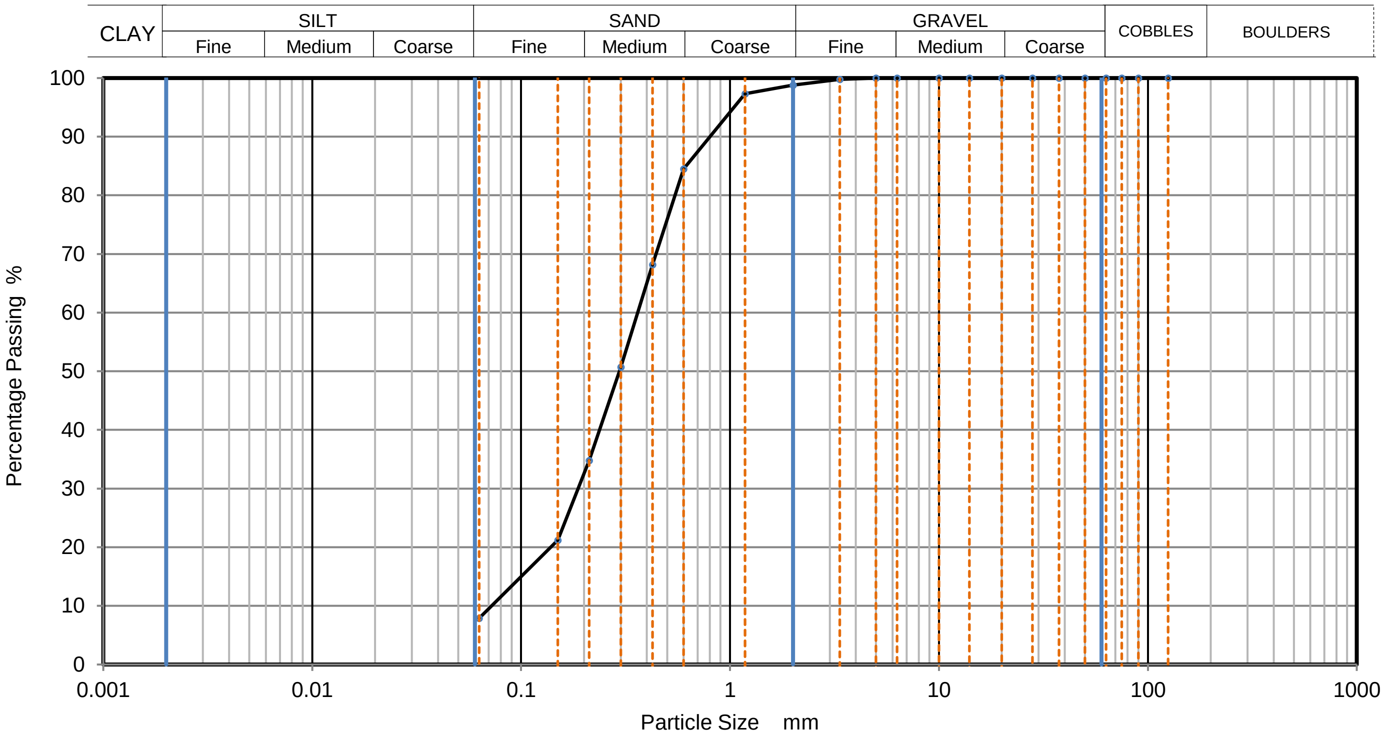
Preparation and testing in accordance with BS1377 unless noted below

| Approved |
|---|
| Stephen.Watson |

LAB 05R Version 4

UKAS TESTING 10122

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | Job Ref | **18-1301** |
| | | Borehole/Pit No. | BH01 |
| Site Name | Ballymany, Newbridge, Co. Kildare | Sample No. | 15 |
| Soil Description | Brown slightly silty fine to coarse SAND. | Depth, m | 4.80 |
| Specimen Reference | 4   Specimen Depth   4.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | KeyLAB ID | Caus2018112221 |



| **Sieving** | | **Sedimentation** | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 99 | | |
| 1.18 | 97 | | |
| 0.6 | 85 | | |
| 0.425 | 68 | | |
| 0.3 | 51 | | |
| 0.212 | 35 | | |
| 0.15 | 21 | | |
| 0.063 | 8 | | |

| | |
|---|---|
| Dry Mass of sample, g | 493 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 1 |
| Sand | 91 |
| | |
| Fines <0.063mm | 8 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.361 |
| D30 | mm | 0.188 |
| D10 | mm | 0.0723 |
| Uniformity Coefficient | | 5 |
| Curvature Coefficient | | 1.3 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

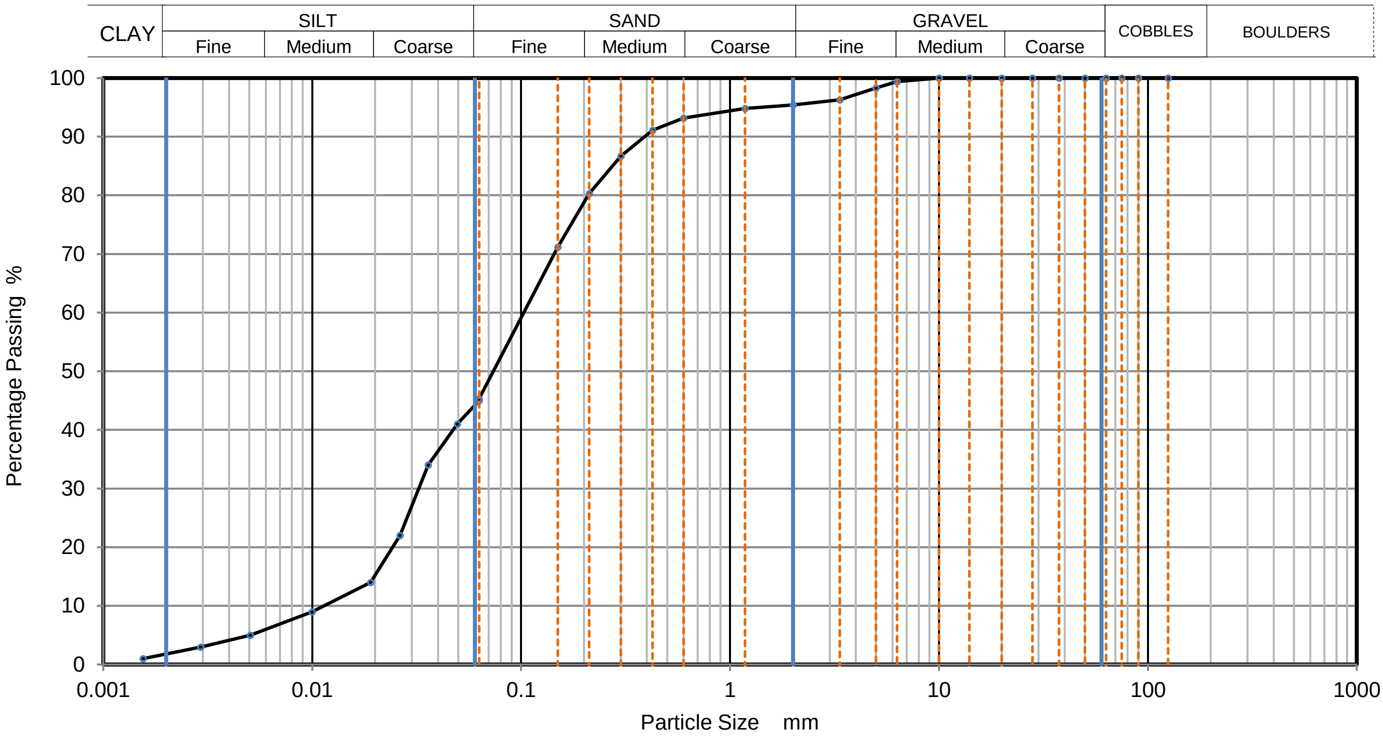
| Approved |
|---|
| Stephen.Watson |

LAB 05R Version 4

UKAS TESTING 10122

# PARTICLE SIZE DISTRIBUTION

| | | | | | |
|---|---|---|---|---|---|
| | | | | Job Ref | **18-1301** |
| | | | | Borehole/Pit No. | BH02 |
| Site Name | Ballymany, Newbridge, Co. Kildare | | | Sample No. | 1 |
| Soil Description | Brown slightly gravelly silty fine to coarse SAND. | | | Depth, m | 0.80 |
| Specimen Reference | 4 | Specimen Depth | 0.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018112222 |



| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 45 |
| 90 | 100 | 0.0496 | 41 |
| 75 | 100 | 0.0359 | 34 |
| 63 | 100 | 0.0263 | 22 |
| 50 | 100 | 0.0190 | 14 |
| 37.5 | 100 | 0.0100 | 9 |
| 28 | 100 | 0.0050 | 5 |
| 20 | 100 | 0.0029 | 3 |
| 14 | 100 | 0.0015 | 1 |
| 10 | 100 | | |
| 6.3 | 99 | | |
| 5 | 98 | | |
| 3.35 | 96 | | |
| 2 | 95 | | |
| 1.18 | 95 | | |
| 0.6 | 93 | Particle density | (assumed) |
| 0.425 | 91 | 2.65 | Mg/m3 |
| 0.3 | 87 | | |
| 0.212 | 80 | | |
| 0.15 | 71 | | |
| 0.063 | 45 | | |

| | |
|---|---|
| Dry Mass of sample, g | 841 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 5 |
| Sand | 50 |
| Silt | 44 |
| Clay | 2 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.103 |
| D30 | mm | 0.0326 |
| D10 | mm | 0.0118 |
| Uniformity Coefficient | | 8.8 |
| Curvature Coefficient | | 0.87 |

Remarks

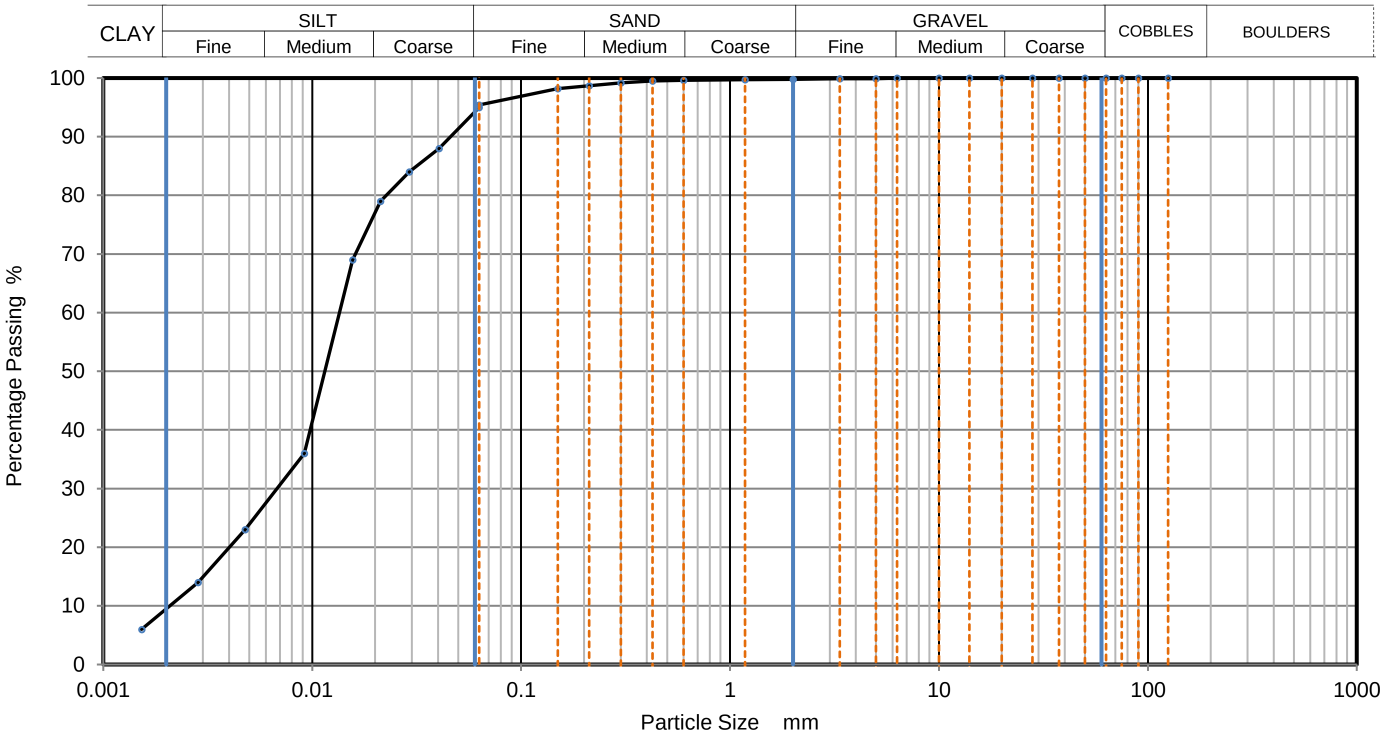
Preparation and testing in accordance with BS1377 unless noted below

| |
|---|
| Approved |
| Stephen.Watson |

LAB 05R Version 4

UKAS TESTING 10122

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **18-1301** |
| | | | | Borehole/Pit No. | BH02 |
| Site Name | Ballymany, Newbridge, Co. Kildare | | | Sample No. | 5 |
| Soil Description | Brown slightly sandy silty CLAY. | | | Depth, m | 4.80 |
| Specimen Reference | 7 | Specimen Depth | 4.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018112223 |



| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 95 |
| 90 | 100 | 0.0405 | 88 |
| 75 | 100 | 0.0292 | 84 |
| 63 | 100 | 0.0212 | 79 |
| 50 | 100 | 0.0156 | 69 |
| 37.5 | 100 | 0.0092 | 36 |
| 28 | 100 | 0.0048 | 23 |
| 20 | 100 | 0.0028 | 14 |
| 14 | 100 | 0.0015 | 6 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 100 | | |
| 0.6 | 100 | Particle density | (assumed) |
| 0.425 | 100 | 2.65 | Mg/m3 |
| 0.3 | 99 | | |
| 0.212 | 99 | | |
| 0.15 | 98 | | |
| 0.063 | 95 | | |

| | |
|---|---|
| Dry Mass of sample, g | 837 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 0 |
| Sand | 4 |
| Silt | 86 |
| Clay | 10 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.0134 |
| D30 | mm | 0.00678 |
| D10 | mm | 0.00208 |
| Uniformity Coefficient | | 6.5 |
| Curvature Coefficient | | 1.6 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

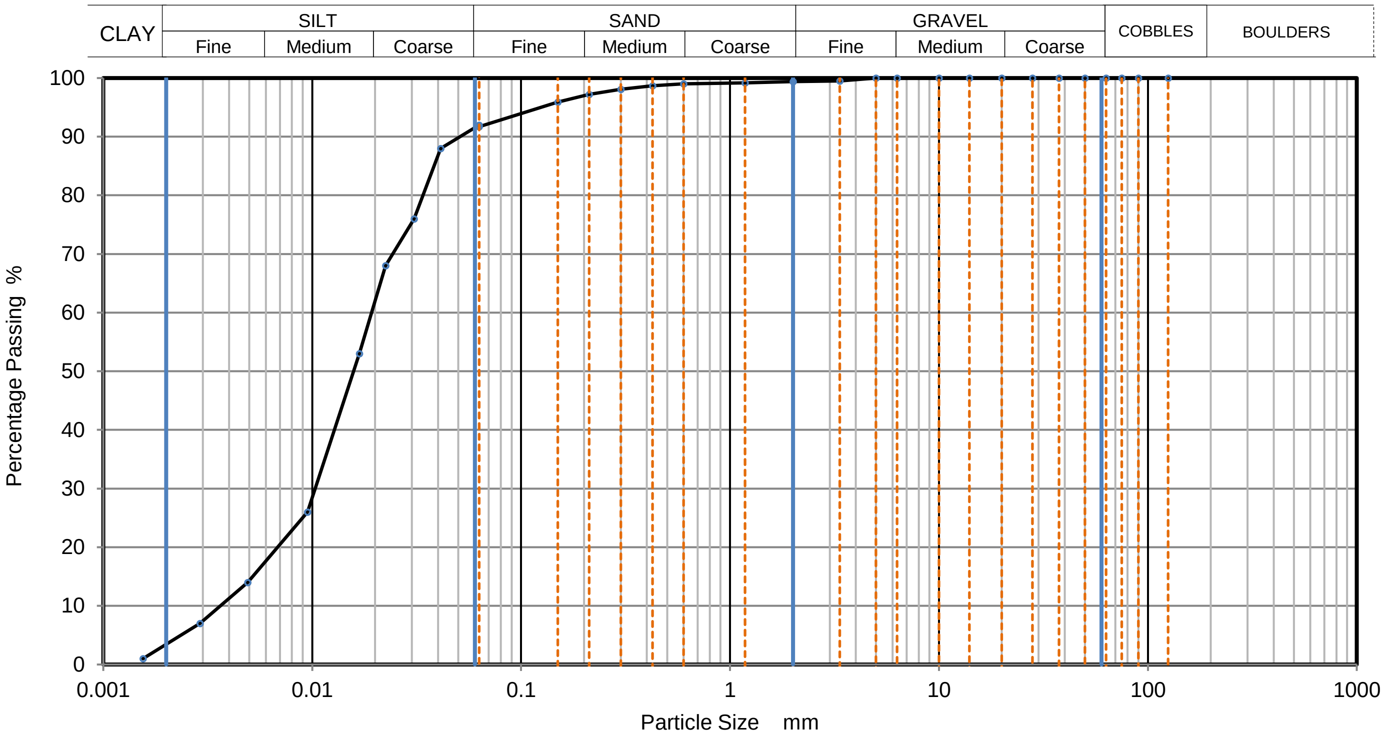
| |
|---|
| Approved |
| Stephen.Watson |

LAB 05R Version 4

UKAS TESTING 10122

# PARTICLE SIZE DISTRIBUTION

| | | | |
|---|---|---|---|
| Job Ref | | | **18-1301** |
| Borehole/Pit No. | | | BH02 |
| Site Name | Ballymany, Newbridge, Co. Kildare | Sample No. | 6 |
| Soil Description | Brown slightly sandy silty CLAY. | Depth, m | 5.80 |
| Specimen Reference | 7 | Specimen Depth | 5.8 m |
| Sample Type | B | | |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | KeyLAB ID | Caus2018112224 |



| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 92 |
| 90 | 100 | 0.0412 | 88 |
| 75 | 100 | 0.0307 | 76 |
| 63 | 100 | 0.0225 | 68 |
| 50 | 100 | 0.0168 | 53 |
| 37.5 | 100 | 0.0095 | 26 |
| 28 | 100 | 0.0049 | 14 |
| 20 | 100 | 0.0029 | 7 |
| 14 | 100 | 0.0015 | 1 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 99 | | |
| 1.18 | 99 | | |
| 0.6 | 99 | Particle density | (assumed) |
| 0.425 | 99 | 2.65 | Mg/m3 |
| 0.3 | 98 | | |
| 0.212 | 97 | | |
| 0.15 | 96 | | |
| 0.063 | 92 | | |

| Dry Mass of sample, g | 1234 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 1 |
| Sand | 8 |
| Silt | 89 |
| Clay | 3 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.0192 |
| D30 | mm | 0.0104 |
| D10 | mm | 0.00366 |
| Uniformity Coefficient | | 5.2 |
| Curvature Coefficient | | 1.5 |

Remarks

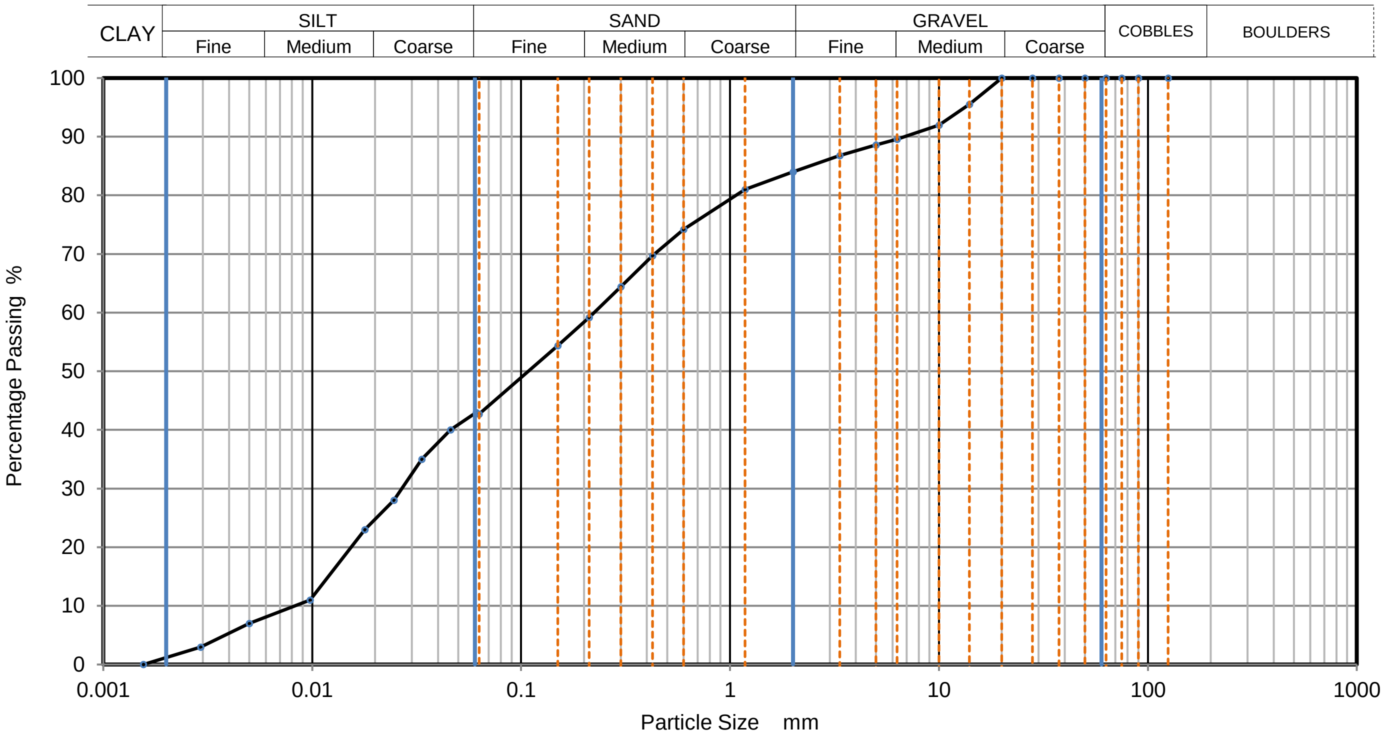
Preparation and testing in accordance with BS1377 unless noted below

| Approved |
|---|
| Stephen.Watson |

LAB 05R Version 4

UKAS TESTING 10122

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | Job Ref | **18-1301** |
| | | Borehole/Pit No. | BH03 |
| Site Name | Ballymany, Newbridge, Co. Kildare | Sample No. | 11 |
| Soil Description | Brown sandy slightly gravelly silty CLAY. | Depth, m | 0.80 |
| Specimen Reference | 7 Specimen Depth 0.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | KeyLAB ID | Caus2018112225 |



| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0609 | 43 |
| 90 | 100 | 0.0459 | 40 |
| 75 | 100 | 0.0334 | 35 |
| 63 | 100 | 0.0246 | 28 |
| 50 | 100 | 0.0179 | 23 |
| 37.5 | 100 | 0.0098 | 11 |
| 28 | 100 | 0.0050 | 7 |
| 20 | 100 | 0.0029 | 3 |
| 14 | 96 | 0.0016 | 0 |
| 10 | 92 | | |
| 6.3 | 90 | | |
| 5 | 89 | | |
| 3.35 | 87 | | |
| 2 | 84 | | |
| 1.18 | 81 | | |
| 0.6 | 74 | Particle density | (assumed) |
| 0.425 | 70 | 2.65 | Mg/m3 |
| 0.3 | 64 | | |
| 0.212 | 59 | | |
| 0.15 | 54 | | |
| 0.063 | 43 | | |

| | |
|---|---|
| Dry Mass of sample, g | 1105 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 16 |
| Sand | 41 |
| Silt | 41 |
| Clay | 1 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.223 |
| D30 | mm | 0.0265 |
| D10 | mm | 0.00811 |
| Uniformity Coefficient | | 28 |
| Curvature Coefficient | | 0.39 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

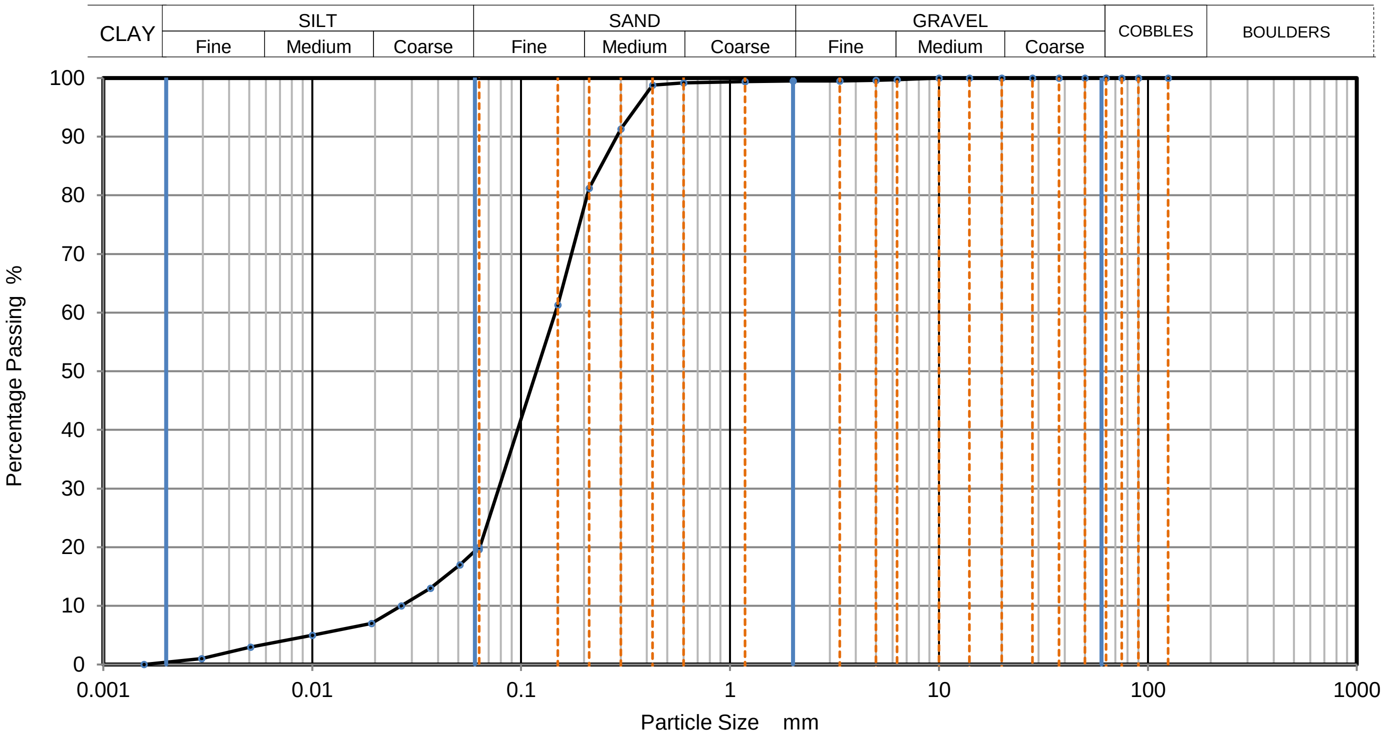
| Approved |
|---|
| Stephen.Watson |

LAB 05R Version 4

UKAS TESTING

10122

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **18-1301** |
| | | | | Borehole/Pit No. | BH03 |
| Site Name | Ballymany, Newbridge, Co. Kildare | | | Sample No. | 12 |
| Soil Description | Brown silty fine to medium SAND. | | | Depth, m | 1.80 |
| Specimen Reference | 7 | Specimen Depth | 1.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018112226 |



| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 20 |
| 90 | 100 | 0.0508 | 17 |
| 75 | 100 | 0.0369 | 13 |
| 63 | 100 | 0.0267 | 10 |
| 50 | 100 | 0.0192 | 7 |
| 37.5 | 100 | 0.0100 | 5 |
| 28 | 100 | 0.0051 | 3 |
| 20 | 100 | 0.0030 | 1 |
| 14 | 100 | 0.0016 | 0 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 99 | | |
| 0.6 | 99 | Particle density | (assumed) |
| 0.425 | 99 | 2.65 | Mg/m3 |
| 0.3 | 91 | | |
| 0.212 | 81 | | |
| 0.15 | 61 | | |
| 0.063 | 20 | | |

| | |
|---|---|
| Dry Mass of sample, g | 778 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 1 |
| Sand | 80 |
| Silt | 19 |
| Clay | 1 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.146 |
| D30 | mm | 0.0782 |
| D10 | mm | 0.0278 |
| Uniformity Coefficient | | 5.2 |
| Curvature Coefficient | | 1.5 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

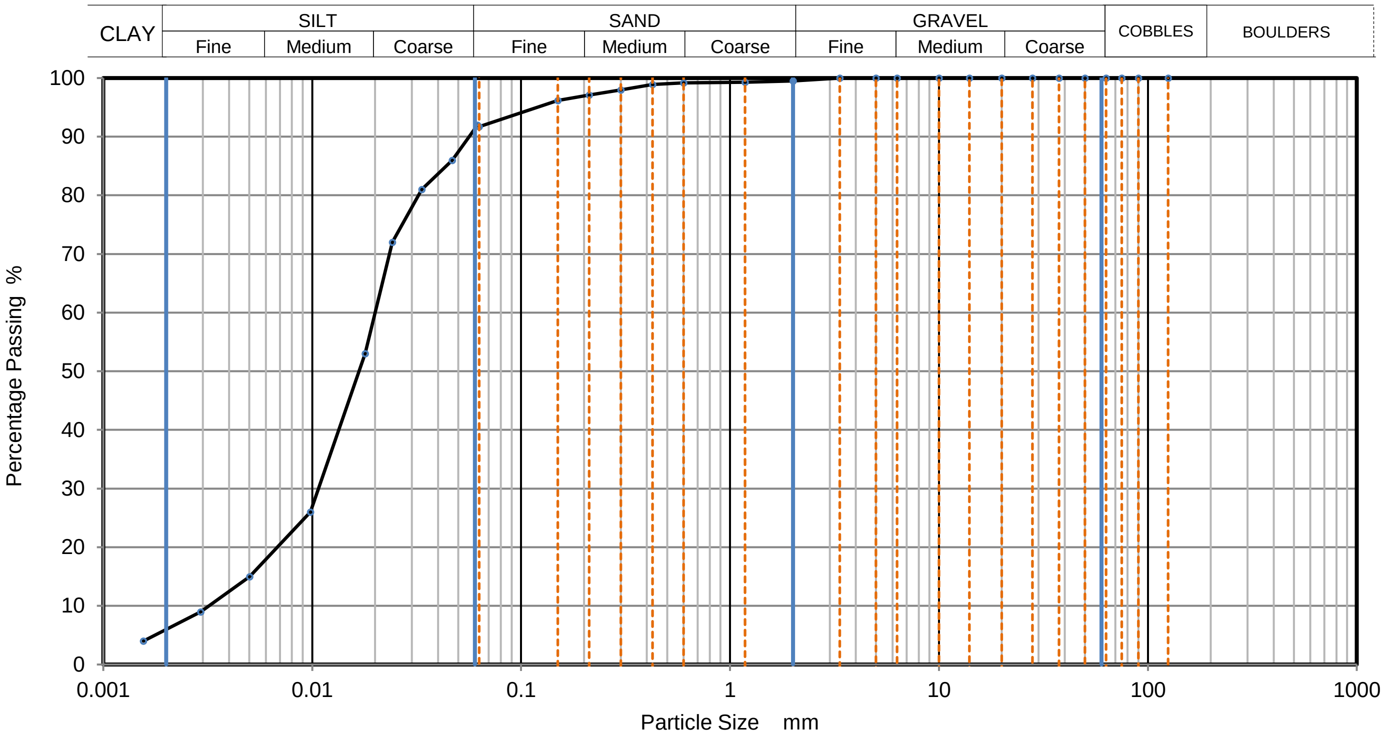
| |
|---|
| Approved |
| Stephen.Watson |

LAB 05R Version 4

UKAS TESTING
10122

# PARTICLE SIZE DISTRIBUTION

| | | | | | |
|---|---|---|---|---|---|
| | | | | Job Ref | **18-1301** |
| | | | | Borehole/Pit No. | BH03 |
| Site Name | Ballymany, Newbridge, Co. Kildare | | | Sample No. | 14 |
| Soil Description | Brown sandy silty CLAY. | | | Depth, m | 3.80 |
| Specimen Reference | 7 | Specimen Depth | 3.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018112227 |



| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0619 | 92 |
| 90 | 100 | 0.0467 | 86 |
| 75 | 100 | 0.0335 | 81 |
| 63 | 100 | 0.0242 | 72 |
| 50 | 100 | 0.0179 | 53 |
| 37.5 | 100 | 0.0098 | 26 |
| 28 | 100 | 0.0050 | 15 |
| 20 | 100 | 0.0029 | 9 |
| 14 | 100 | 0.0016 | 4 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 99 | | |
| 0.6 | 99 | Particle density | (assumed) |
| 0.425 | 99 | 2.65 | Mg/m3 |
| 0.3 | 98 | | |
| 0.212 | 97 | | |
| 0.15 | 96 | | |
| 0.063 | 92 | | |

| | |
|---|---|
| Dry Mass of sample, g | 1516 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 1 |
| Sand | 8 |
| Silt | 86 |
| Clay | 6 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.0199 |
| D30 | mm | 0.0108 |
| D10 | mm | 0.00313 |
| Uniformity Coefficient | | 6.4 |
| Curvature Coefficient | | 1.9 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

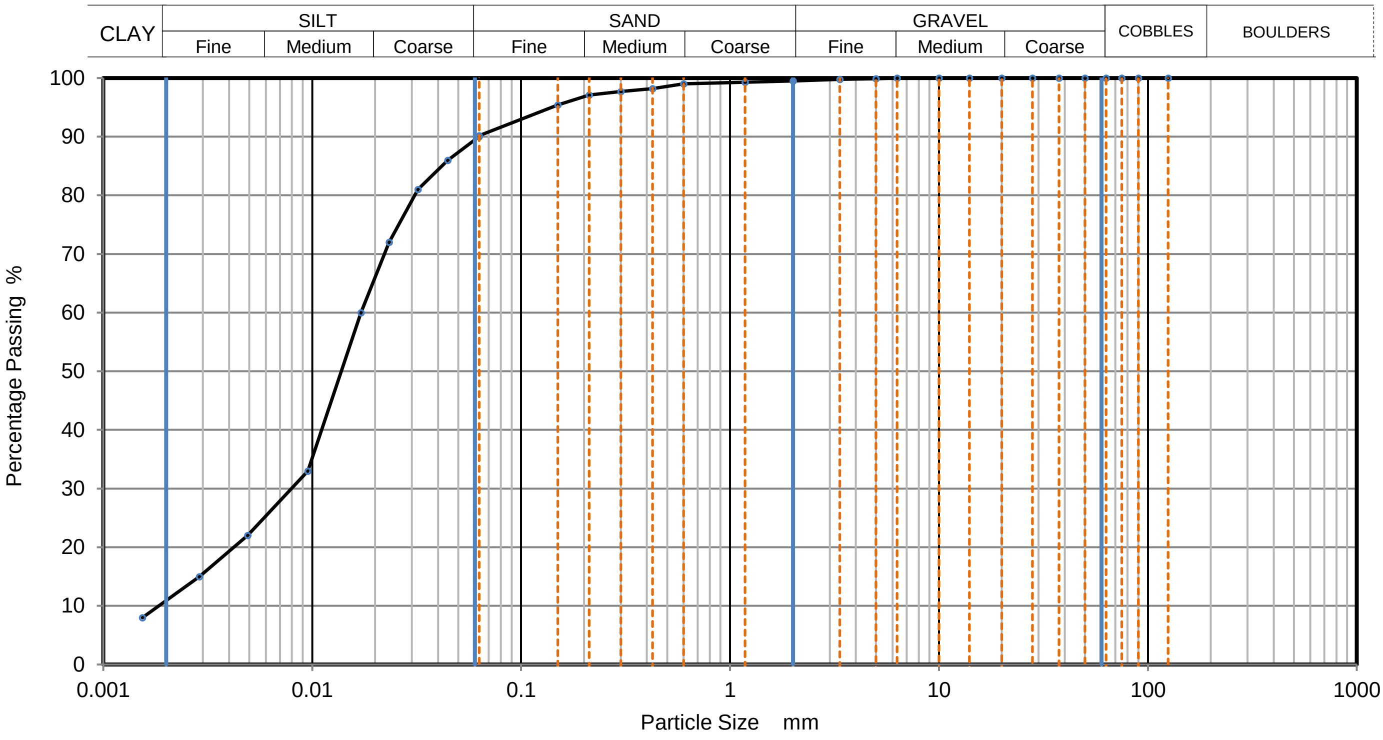
| |
|---|
| Approved |
| Stephen.Watson |

LAB 05R Version 4

UKAS TESTING

10122

| CAUSEWAY GEOTECH | PARTICLE SIZE DISTRIBUTION | | Job Ref | **18-1301** |
|---|---|---|---|---|
| | | | Borehole/Pit No. | BH03 |
| Site Name | Ballymany, Newbridge, Co. Kildare | | Sample No. | 16 |
| Soil Description | Brown sandy silty CLAY. | | Depth, m | 5.80 |
| Specimen Reference | 7 | Specimen Depth 5.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | KeyLAB ID | Caus2018112228 |



| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 90 |
| 90 | 100 | 0.0446 | 86 |
| 75 | 100 | 0.0320 | 81 |
| 63 | 100 | 0.0234 | 72 |
| 50 | 100 | 0.0171 | 60 |
| 37.5 | 100 | 0.0095 | 33 |
| 28 | 100 | 0.0049 | 22 |
| 20 | 100 | 0.0029 | 15 |
| 14 | 100 | 0.0015 | 8 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 99 | | |
| 0.6 | 99 | Particle density | (assumed) |
| 0.425 | 98 | 2.65 | Mg/m3 |
| 0.3 | 98 | | |
| 0.212 | 97 | | |
| 0.15 | 95 | | |
| 0.063 | 90 | | |

| Dry Mass of sample, g | 614 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 1 |
| Sand | 9 |
| Silt | 80 |
| Clay | 11 |

| **Grading Analysis** | |
|---|---|
| D100 mm | |
| D60 mm | 0.017 |
| D30 mm | 0.00803 |
| D10 mm | 0.00189 |
| Uniformity Coefficient | 9 |
| Curvature Coefficient | 2 |

Remarks

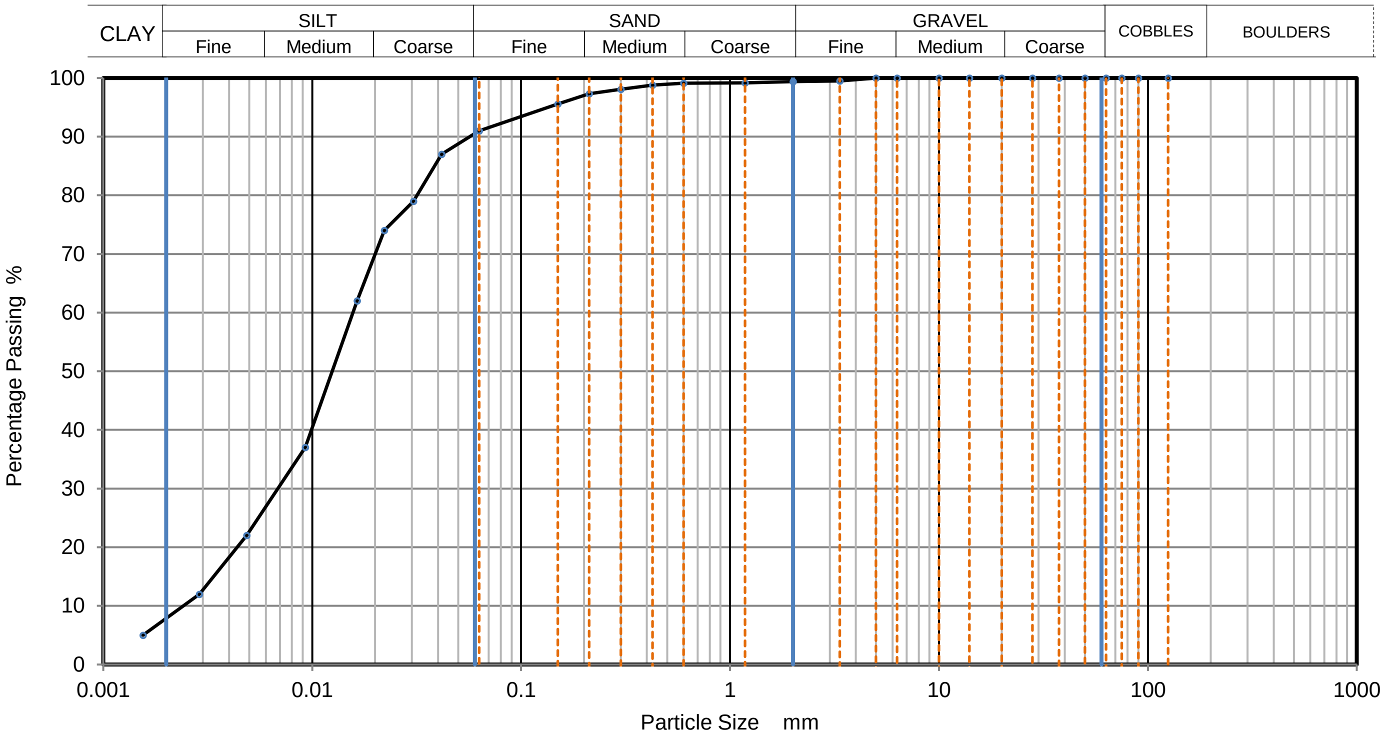
Preparation and testing in accordance with BS1377 unless noted below

| Approved |
|---|
| Stephen.Watson |

LAB 05R Version 4

UKAS TESTING
10122

| CAUSEWAY GEOTECH | PARTICLE SIZE DISTRIBUTION | | | Job Ref | **18-1301** |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH03 |
| Site Name | Ballymany, Newbridge, Co. Kildare | | | Sample No. | 18 |
| Soil Description | Brown sandy SILT/CLAY. | | | Depth, m | 7.80 |
| Specimen Reference | 7 | Specimen Depth | 7.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018112229 |



| **Sieving** | | **Sedimentation** | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 91 |
| 90 | 100 | 0.0416 | 87 |
| 75 | 100 | 0.0305 | 79 |
| 63 | 100 | 0.0221 | 74 |
| 50 | 100 | 0.0164 | 62 |
| 37.5 | 100 | 0.0093 | 37 |
| 28 | 100 | 0.0049 | 22 |
| 20 | 100 | 0.0029 | 12 |
| 14 | 100 | 0.0015 | 5 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 99 | | |
| 1.18 | 99 | | |
| 0.6 | 99 | Particle density | (assumed) |
| 0.425 | 99 | 2.65 | Mg/m3 |
| 0.3 | 98 | | |
| 0.212 | 97 | | |
| 0.15 | 96 | | |
| 0.063 | 91 | | |

| Dry Mass of sample, g | 584 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 1 |
| Sand | 8 |
| Silt | 83 |
| Clay | 8 |

| **Grading Analysis** | |
|---|---|
| D100 mm | |
| D60 mm | 0.0156 |
| D30 mm | 0.00683 |
| D10 mm | 0.00239 |
| Uniformity Coefficient | 6.5 |
| Curvature Coefficient | 1.2 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved |
|---|
| Stephen.Watson |

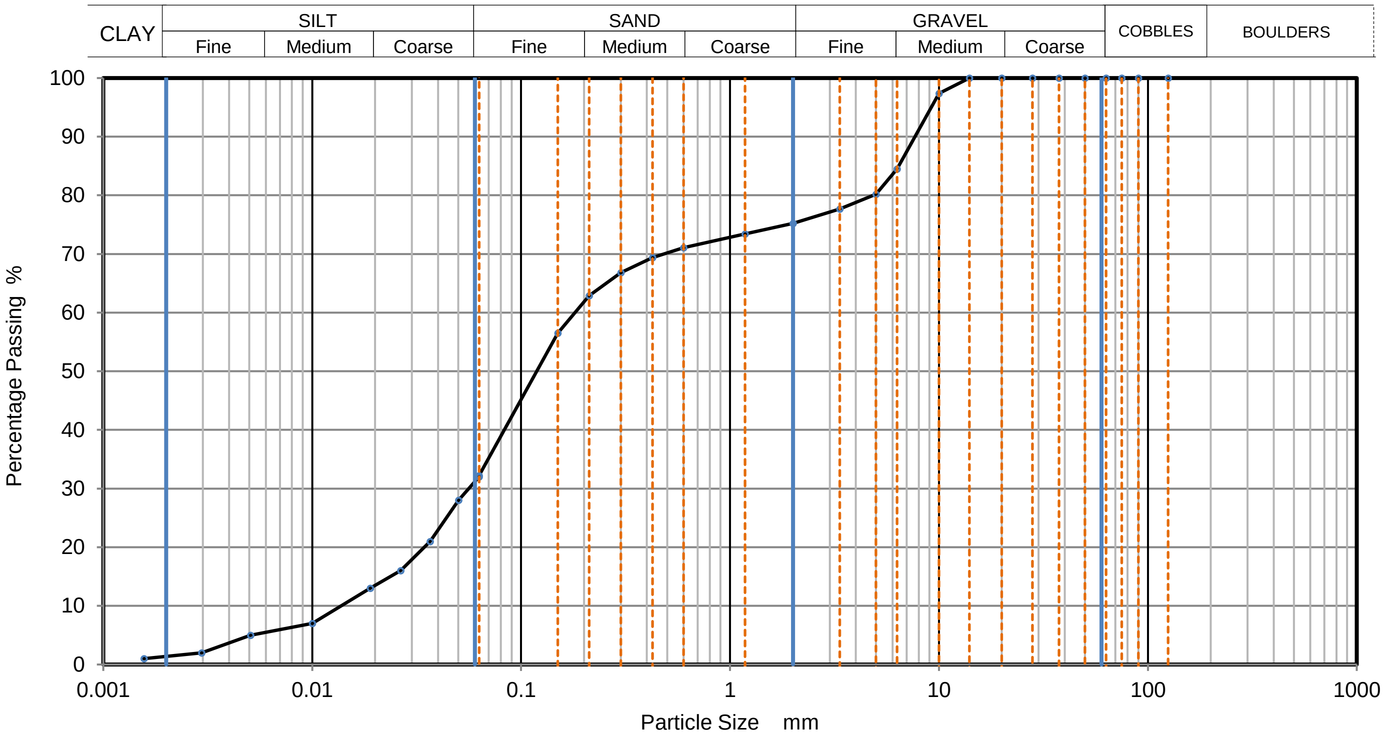
LAB 05R Version 4

UKAS TESTING

10122

# PARTICLE SIZE DISTRIBUTION

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | PARTICLE SIZE DISTRIBUTION | | | Job Ref | **18-1301** |
| | | | | Borehole/Pit No. | BH04 |
| Site Name | Ballymany, Newbridge, Co. Kildare | | | Sample No. | 10 |
| Soil Description | Brown sandy gravelly SILT/CLAY. | | | Depth, m | 0.80 |
| Specimen Reference | 7 | Specimen Depth | 0.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018112230 |



| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 32 |
| 90 | 100 | 0.0502 | 28 |
| 75 | 100 | 0.0366 | 21 |
| 63 | 100 | 0.0265 | 16 |
| 50 | 100 | 0.0190 | 13 |
| 37.5 | 100 | 0.0100 | 7 |
| 28 | 100 | 0.0051 | 5 |
| 20 | 100 | 0.0030 | 2 |
| 14 | 100 | 0.0016 | 1 |
| 10 | 97 | | |
| 6.3 | 85 | | |
| 5 | 80 | | |
| 3.35 | 78 | | |
| 2 | 75 | | |
| 1.18 | 73 | | |
| 0.6 | 71 | Particle density | (assumed) |
| 0.425 | 69 | 2.65 | Mg/m3 |
| 0.3 | 67 | | |
| 0.212 | 63 | | |
| 0.15 | 57 | | |
| 0.063 | 32 | | |

| | |
|---|---|
| Dry Mass of sample, g | 613 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 25 |
| Sand | 43 |
| Silt | 31 |
| Clay | 1 |

| **Grading Analysis** | |
|---|---|
| D100 mm | |
| D60 mm | 0.181 |
| D30 mm | 0.0558 |
| D10 mm | 0.0135 |
| Uniformity Coefficient | 13 |
| Curvature Coefficient | 1.3 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

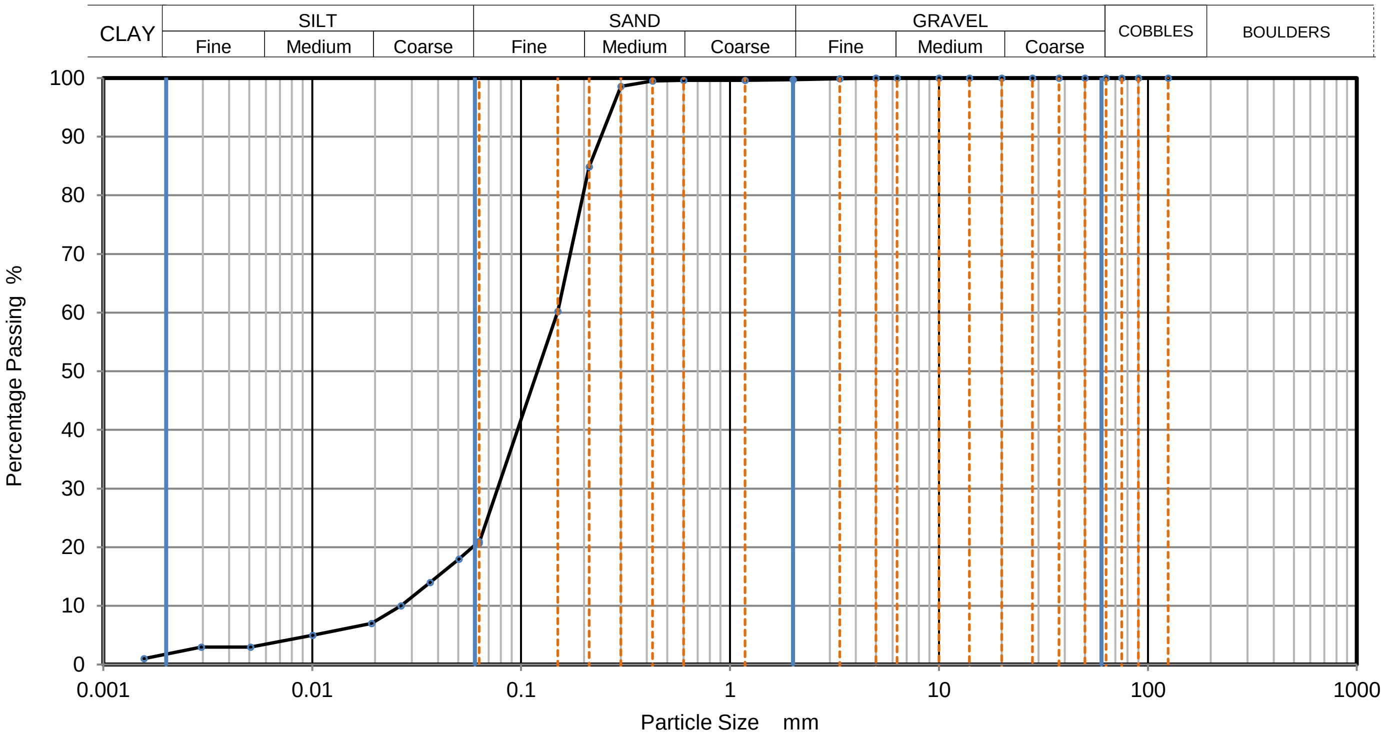
| | |
|---|---|
| Approved | |
| Stephen.Watson | |

UKAS TESTING

10122

# PARTICLE SIZE DISTRIBUTION

| | | | |
|---|---|---|---|
| Job Ref | **18-1301** | | |
| Borehole/Pit No. | BH04 | | |
| Site Name | Ballymany, Newbridge, Co. Kildare | Sample No. | 12 |
| Soil Description | Brown silty fine to medium SAND. | Depth, m | 2.80 |
| Specimen Reference | 7 | Specimen Depth | 2.8 m |
| Sample Type | B | | |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | KeyLAB ID | Caus2018112231 |



| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 21 |
| 90 | 100 | 0.0504 | 18 |
| 75 | 100 | 0.0367 | 14 |
| 63 | 100 | 0.0266 | 10 |
| 50 | 100 | 0.0192 | 7 |
| 37.5 | 100 | 0.0100 | 5 |
| 28 | 100 | 0.0051 | 3 |
| 20 | 100 | 0.0029 | 3 |
| 14 | 100 | 0.0016 | 1 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 100 | | |
| 0.6 | 100 | Particle density | (assumed) |
| 0.425 | 100 | 2.65 | Mg/m3 |
| 0.3 | 99 | | |
| 0.212 | 85 | | |
| 0.15 | 60 | | |
| 0.063 | 21 | | |

| Dry Mass of sample, g | 272 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 0 |
| Sand | 79 |
| Silt | 19 |
| Clay | 2 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.149 |
| D30 | mm | 0.0772 |
| D10 | mm | 0.0257 |
| Uniformity Coefficient | | 5.8 |
| Curvature Coefficient | | 1.6 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved |
|---|
| Stephen.Watson |

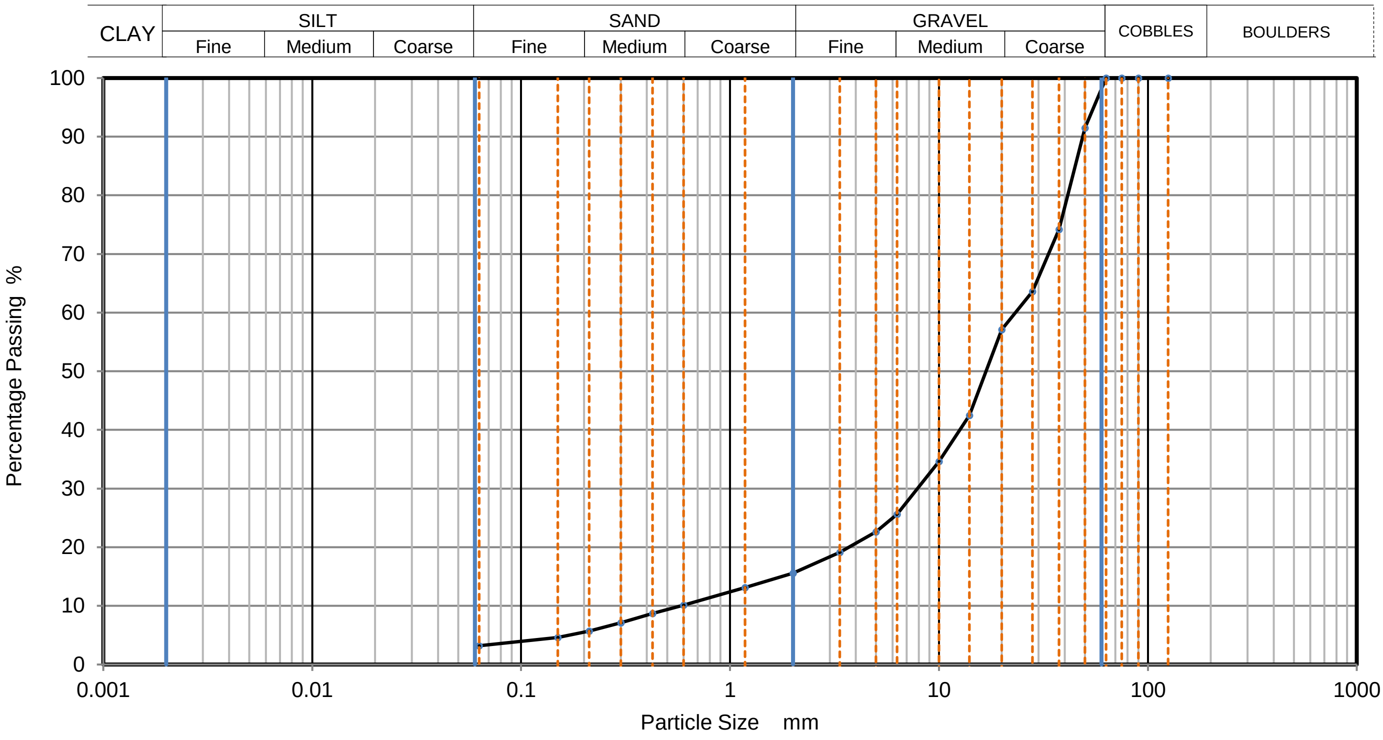
LAB 05R Version 4

UKAS TESTING

10122

# PARTICLE SIZE DISTRIBUTION

| | | | |
|---|---|---|---|
| | | Job Ref | **18-1301** |
| | | Borehole/Pit No. | BH05 |
| Site Name | Ballymany, Newbridge, Co. Kildare | Sample No. | 12 |
| Soil Description | Brown slightly sandy subrounded fine to coarse GRAVEL. | Depth, m | 1.80 |
| Specimen Reference | 7 Specimen Depth 1.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | KeyLAB ID | Caus2018112233 |



| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 92 | | |
| 37.5 | 74 | | |
| 28 | 64 | | |
| 20 | 57 | | |
| 14 | 43 | | |
| 10 | 35 | | |
| 6.3 | 26 | | |
| 5 | 23 | | |
| 3.35 | 19 | | |
| 2 | 16 | | |
| 1.18 | 13 | | |
| 0.6 | 10 | | |
| 0.425 | 9 | | |
| 0.3 | 7 | | |
| 0.212 | 6 | | |
| 0.15 | 5 | | |
| 0.063 | 3 | | |

| | |
|---|---|
| Dry Mass of sample, g | 6697 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 84 |
| Sand | 12 |
| | |
| Fines <0.063mm | 3 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 23.2 |
| D30 | mm | 7.91 |
| D10 | mm | 0.581 |
| Uniformity Coefficient | | 40 |
| Curvature Coefficient | | 4.6 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| |
|---|
| Approved |
| Stephen.Watson |

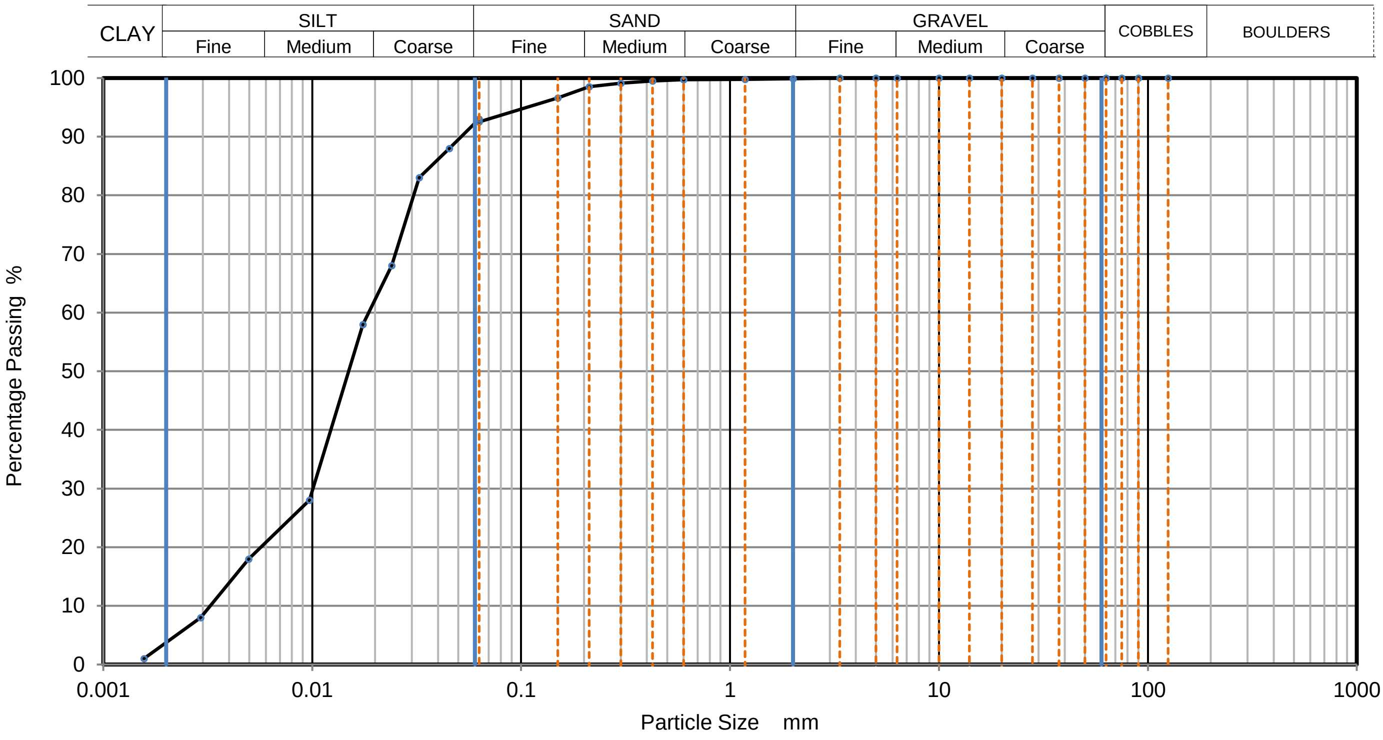
LAB 05R Version 4

UKAS TESTING

10122

# PARTICLE SIZE DISTRIBUTION

| | | | | | |
|---|---|---|---|---|---|
| | | | | Job Ref | **18-1301** |
| | | | | Borehole/Pit No. | BH05 |
| Site Name | Ballymany, Newbridge, Co. Kildare | | | Sample No. | 15 |
| Soil Description | Brown slightly sandy silty CLAY. | | | Depth, m | 4.80 |
| Specimen Reference | 7 | Specimen Depth | 4.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018112234 |



| **Sieving** | | **Sedimentation** | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 93 |
| 90 | 100 | 0.0453 | 88 |
| 75 | 100 | 0.0325 | 83 |
| 63 | 100 | 0.0240 | 68 |
| 50 | 100 | 0.0175 | 58 |
| 37.5 | 100 | 0.0097 | 28 |
| 28 | 100 | 0.0050 | 18 |
| 20 | 100 | 0.0029 | 8 |
| 14 | 100 | 0.0016 | 1 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 100 | | |
| 0.6 | 100 | Particle density | (assumed) |
| 0.425 | 100 | 2.65 | Mg/m3 |
| 0.3 | 99 | | |
| 0.212 | 99 | | |
| 0.15 | 97 | | |
| 0.063 | 93 | | |

| | |
|---|---|
| Dry Mass of sample, g | 652 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 0 |
| Sand | 7 |
| Silt | 89 |
| Clay | 4 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.0187 |
| D30 | mm | 0.0101 |
| D10 | mm | 0.00319 |
| Uniformity Coefficient | | 5.9 |
| Curvature Coefficient | | 1.7 |

Remarks

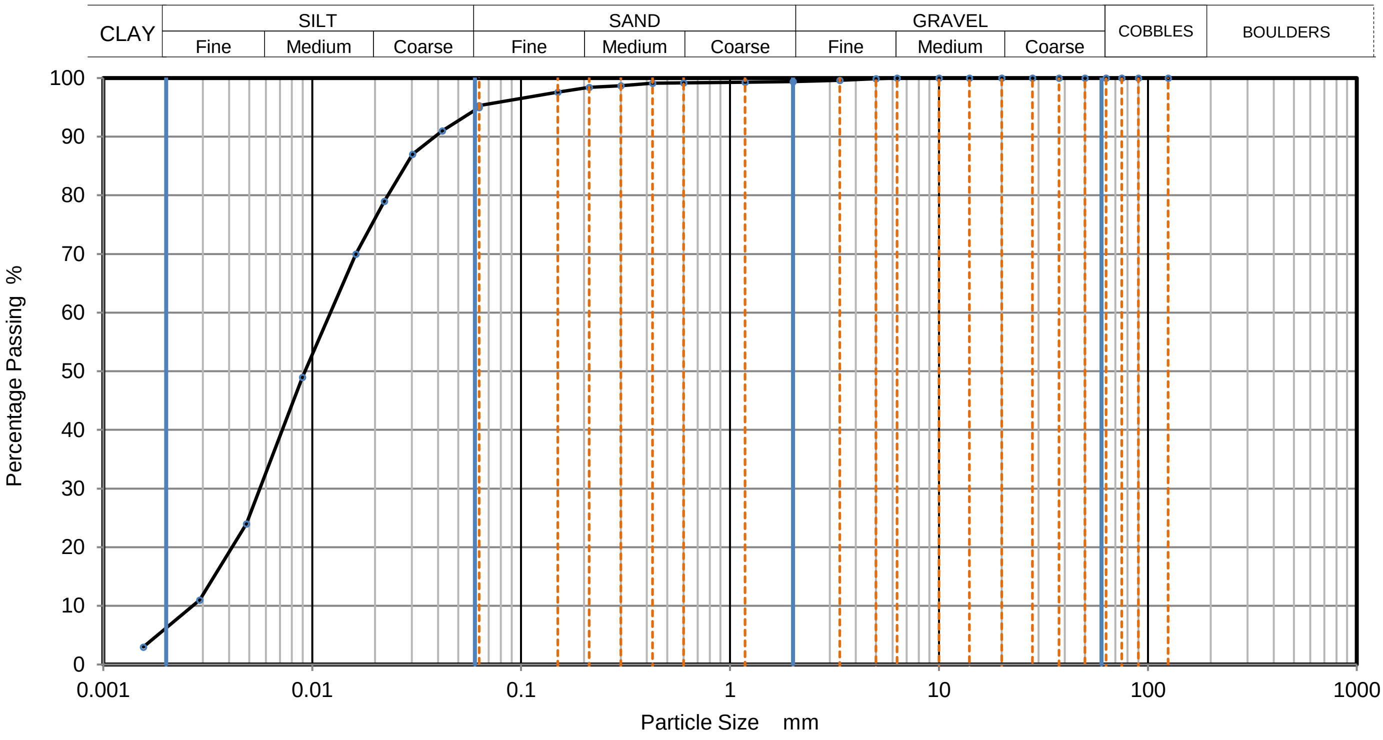
Preparation and testing in accordance with BS1377 unless noted below

| |
|---|
| Approved |
| Stephen.Watson |

LAB 05R Version 4

10122

| CAUSEWAY GEOTECH | PARTICLE SIZE DISTRIBUTION | | Job Ref | **18-1301** |
|---|---|---|---|---|
| | | | Borehole/Pit No. | BH06 |
| Site Name | Ballymany, Newbridge, Co. Kildare | | Sample No. | 10 |
| Soil Description | Brown slightly sandy silty CLAY. | | Depth, m | 1.80 |
| Specimen Reference | 7 | Specimen Depth | 1.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | KeyLAB ID | Caus2018112235 |



| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 95 |
| 90 | 100 | 0.0419 | 91 |
| 75 | 100 | 0.0302 | 87 |
| 63 | 100 | 0.0221 | 79 |
| 50 | 100 | 0.0162 | 70 |
| 37.5 | 100 | 0.0090 | 49 |
| 28 | 100 | 0.0048 | 24 |
| 20 | 100 | 0.0029 | 11 |
| 14 | 100 | 0.0016 | 3 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 99 | | |
| 1.18 | 99 | | |
| 0.6 | 99 | Particle density | (assumed) |
| 0.425 | 99 | 2.65 | Mg/m3 |
| 0.3 | 99 | | |
| 0.212 | 98 | | |
| 0.15 | 98 | | |
| 0.063 | 95 | | |

| | |
|---|---|
| Dry Mass of sample, g | 262 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 1 |
| Sand | 4 |
| Silt | 89 |
| Clay | 6 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.0122 |
| D30 | mm | 0.00562 |
| D10 | mm | 0.00262 |
| Uniformity Coefficient | | 4.6 |
| Curvature Coefficient | | 0.99 |

Remarks

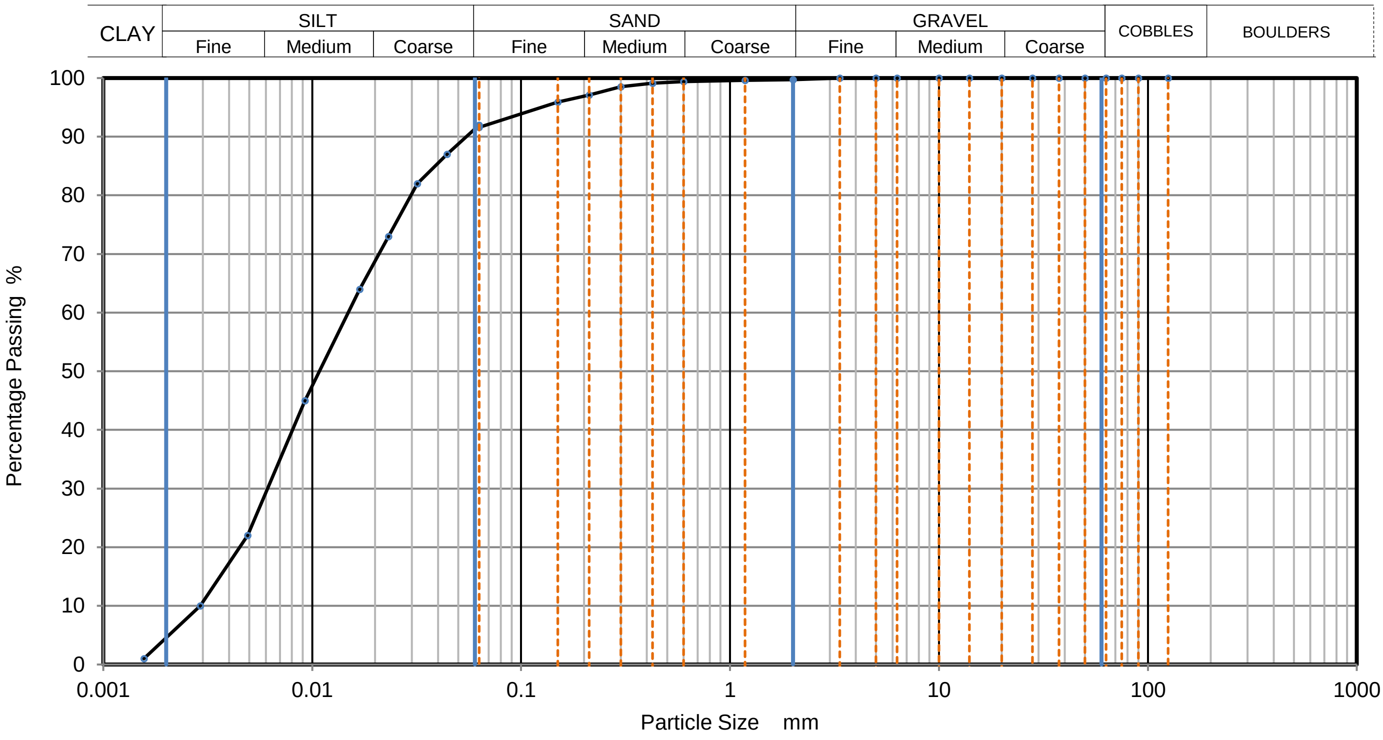
Preparation and testing in accordance with BS1377 unless noted below

| Approved |
|---|
| Stephen.Watson |

LAB 05R Version 4

UKAS TESTING
10122

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **18-1301** |
| | | | | Borehole/Pit No. | BH06 |
| Site Name | Ballymany, Newbridge, Co. Kildare | | | Sample No. | 12 |
| Soil Description | Brown slightly sandy SILT. | | | Depth, m | 3.80 |
| Specimen Reference | 7 | Specimen Depth | 3.8 m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018112236 |



| **Sieving** | | **Sedimentation** | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 92 |
| 90 | 100 | 0.0442 | 87 |
| 75 | 100 | 0.0318 | 82 |
| 63 | 100 | 0.0232 | 73 |
| 50 | 100 | 0.0169 | 64 |
| 37.5 | 100 | 0.0092 | 45 |
| 28 | 100 | 0.0049 | 22 |
| 20 | 100 | 0.0029 | 10 |
| 14 | 100 | 0.0016 | 1 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 100 | | |
| 0.6 | 99 | Particle density | (assumed) |
| 0.425 | 99 | 2.65 | Mg/m3 |
| 0.3 | 99 | | |
| 0.212 | 97 | | |
| 0.15 | 96 | | |
| 0.063 | 92 | | |

| Dry Mass of sample, g | 599 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 0 |
| Sand | 8 |
| Silt | 87 |
| Clay | 5 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.015 |
| D30 | mm | 0.00612 |
| D10 | mm | 0.00287 |
| Uniformity Coefficient | | 5.2 |
| Curvature Coefficient | | 0.87 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved |
|---|
| Stephen.Watson |

LAB 05R Version 4

UKAS TESTING

10122

UKAS
TESTING
2183

Chemtest
The right chemistry to deliver results
**Chemtest Ltd.**
**Depot Road**
**Newmarket**
**CB8 0AL**
**Tel: 01638 606070**
**Email: info@chemtest.com**

# Final Report

| | | | |
|---|---|---|---|
| **Report No.:** | 18-37332-1 | | |
| **Initial Date of Issue:** | 30-Nov-2018 | | |
| **Client** | Causeway Geotech Ltd | | |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL | | |
| **Contact(s):** | Carin Cornwall<br>Colm Hurley<br>Darren O'Mahony<br>Gabriella Horan<br>John Cameron<br>Lucy Newland<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Sean Ross<br>Stephen Franey<br>Stephen Watson<br>Stuart Abraham | | |
| **Project** | 18-1301 Ballymany, Newbridge, Co Kildare | | |
| **Quotation No.:** | | **Date Received:** | 28-Nov-2018 |
| **Order No.:** | | **Date Instructed:** | 28-Nov-2018 |
| **No. of Samples:** | 2 | | |
| **Turnaround (Wkdays):** | 3 | **Results Due:** | 30-Nov-2018 |
| **Date Approved:** | 30-Nov-2018 | | |

**Approved By:**

**Details:** Glynn Harvey, Laboratory Manager

# Results - Soil

**Project: 18-1301 Ballymany, Newbridge, Co Kildare**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-37332 | 18-37332 |
|---|---|---|---|---|---|---|
| Quotation No.: | | | | **Chemtest Sample ID.:** | 732012 | 732013 |
| Order No.: | | | | Client Sample Ref.: | 1 | 2 |
| | | | | Sample Location: | BH01 | BH02 |
| | | | | Sample Type: | SOIL | SOIL |
| | | | | Top Depth (m): | 1.50 | 0.80 |
| | | | | Date Sampled: | 27-Nov-2018 | 27-Nov-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| Moisture | N | 2030 | % | 0.020 | 21 | 11 |
| pH | U | 2010 | | N/A | 9.3 | 9.1 |
| Sulphate (2:1 Water Soluble) as SO4 | U | 2120 | g/l | 0.010 | < 0.010 | < 0.010 |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

# LABORATORY RESTRICTION REPORT

| | | | |
|---|---|---|---|
| Project Reference | 18-1301 | To | Sean Ross |
| | | Position | Project Manager |
| Project Name | Ballymany, Newbridge, Co. Kildare | From | Stephen Watson |
| TR reference | 18-1301 / 1 | Position | Laboratory Manager |

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

| Hole Number | Sample | | | Test Type | Reason for Restriction | Required Action |
|---|---|---|---|---|---|---|
| | Number | Depth (m) | Type | | | |
| BH05 | 12 | 1.80-2.20 | B | Atterberg Limits | GRAVEL - Not suitable | Cancel |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

For electronic reporting a form of electronic signature or printed name is acceptable

| Laboratory Signature | Project Manager Signature |
|---|---|
| Stephen Watson | Darren O'Mahony |
| Date<br>06 December 2018 | Date<br>06 December 2018 |

# APPENDIX D

# ENVIRONMENTAL LABORATORY TEST RESULTS

UKAS
TESTING
2183

Chemtest
The right chemistry to deliver results
**Chemtest Ltd.**
**Depot Road**
**Newmarket**
**CB8 0AL**
**Tel: 01638 606070**
**Email: info@chemtest.com**

# Final Report

**Report No.:** 18-36299-1

**Initial Date of Issue:** 27-Nov-2018

**Client** Causeway Geotech Ltd

**Client Address:**
8 Drumahiskey Road
Balnamore
Ballymoney
County Antrim
BT53 7QL

**Contact(s):**
Carin Cornwall
Colm Hurley
Darren O'Mahony
Gabriella Horan
John Cameron
Lucy Newland
Matthew Gilbert
Neil Haggan
Paul Dunlop
Paul McNamara
Sean Ross
Stephen Franey
Stephen Watson
Stuart Abraham

**Project** 18-1301 Ballymany Newbridge

**Quotation No.:** Q18-13245

**Date Received:** 16-Nov-2018

**Order No.:**

**Date Instructed:** 22-Nov-2018

**No. of Samples:** 2

**Turnaround (Wkdays):** 4

**Results Due:** 27-Nov-2018

**Date Approved:** 27-Nov-2018

**Approved By:**

**Details:** Martin Dyer, Laboratory Manager

# Results - Soil

**Project: 18-1301 Ballymany Newbridge**

| **Client: Causeway Geotech Ltd** | **Chemtest Job No.:** | | | | 18-36299 | 18-36299 |
|---|---|---|---|---|---|---|
| Quotation No.: Q18-13245 | **Chemtest Sample ID.:** | | | | 727491 | 727496 |
| Order No.: | Client Sample Ref.: | | | | ES1 | ES2 |
| | Sample Location: | | | | BH01 | BH03 |
| | Sample Type: | | | | SOIL | SOIL |
| | Top Depth (m): | | | | 0.5 | 1.0 |
| | Date Sampled: | | | | 12-Nov-2018 | 13-Nov-2018 |
| | Asbestos Lab: | | | | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| ACM Type | U | 2192 | | N/A | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | No Asbestos Detected |
| Moisture | N | 2030 | % | 0.020 | 7.9 | 11 |
| pH | U | 2010 | | N/A | 9.0 | 8.7 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 13 | 11 |
| Barium | U | 2450 | mg/kg | 10 | 25 | 34 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 0.99 | 1.3 |
| Chromium | U | 2450 | mg/kg | 1.0 | 12 | 14 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | < 2.0 | < 2.0 |
| Antimony | N | 2450 | mg/kg | 2.0 | < 2.0 | < 2.0 |
| Copper | U | 2450 | mg/kg | 0.50 | 8.8 | 11 |
| Mercury | U | 2450 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Nickel | U | 2450 | mg/kg | 0.50 | 26 | 35 |
| Lead | U | 2450 | mg/kg | 0.50 | 17 | 19 |
| Selenium | U | 2450 | mg/kg | 0.20 | < 0.20 | < 0.20 |
| Zinc | U | 2450 | mg/kg | 0.50 | 58 | 73 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 12 | 14 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 |
| Total Organic Carbon | U | 2625 | % | 0.20 | 0.46 | 0.63 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aliphatic TPH >C8-C10 | U | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aliphatic TPH >C10-C12 | U | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aliphatic TPH >C12-C16 | U | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aliphatic TPH >C16-C21 | U | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aliphatic TPH >C21-C35 | U | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 5.0 | < 5.0 | < 5.0 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aromatic TPH >C8-C10 | U | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aromatic TPH >C10-C12 | U | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aromatic TPH >C12-C16 | U | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aromatic TPH >C16-C21 | U | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aromatic TPH >C21-C35 | U | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 5.0 | < 5.0 | < 5.0 |

# Results - Soil

**Project: 18-1301 Ballymany Newbridge**

| **Client: Causeway Geotech Ltd** | **Chemtest Job No.:** | | | | 18-36299 | 18-36299 |
|---|---|---|---|---|---|---|
| Quotation No.: Q18-13245 | **Chemtest Sample ID.:** | | | | 727491 | 727496 |
| Order No.: | Client Sample Ref.: | | | | ES1 | ES2 |
| | Sample Location: | | | | BH01 | BH03 |
| | Sample Type: | | | | SOIL | SOIL |
| | Top Depth (m): | | | | 0.5 | 1.0 |
| | Date Sampled: | | | | 12-Nov-2018 | 13-Nov-2018 |
| | Asbestos Lab: | | | | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 10.0 | < 10 | < 10 |
| Benzene | U | 2760 | µg/kg | 1.0 | < 1.0 | < 1.0 |
| Toluene | U | 2760 | µg/kg | 1.0 | < 1.0 | < 1.0 |
| Ethylbenzene | U | 2760 | µg/kg | 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 2760 | µg/kg | 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 2760 | µg/kg | 1.0 | < 1.0 | < 1.0 |
| Methyl Tert-Butyl Ether | U | 2760 | µg/kg | 1.0 | < 1.0 | < 1.0 |
| Naphthalene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Acenaphthylene | N | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Acenaphthene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Fluorene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Phenanthrene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Anthracene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Fluoranthene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Pyrene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Benzo[a]anthracene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Chrysene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Benzo[b]fluoranthene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Benzo[k]fluoranthene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Benzo[a]pyrene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Indeno(1,2,3-c,d)Pyrene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Benzo[g,h,i]perylene | U | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Coronene | N | 2800 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 2.0 | < 2.0 | < 2.0 |
| PCB 28 | U | 2815 | mg/kg | 0.010 | < 0.010 | < 0.010 |
| PCB 52 | U | 2815 | mg/kg | 0.010 | < 0.010 | < 0.010 |
| PCB 90+101 | U | 2815 | mg/kg | 0.010 | < 0.010 | < 0.010 |
| PCB 118 | U | 2815 | mg/kg | 0.010 | < 0.010 | < 0.010 |
| PCB 153 | U | 2815 | mg/kg | 0.010 | < 0.010 | < 0.010 |
| PCB 138 | U | 2815 | mg/kg | 0.010 | < 0.010 | < 0.010 |
| PCB 180 | U | 2815 | mg/kg | 0.010 | < 0.010 | < 0.010 |
| Total PCBs (7 Congeners) | N | 2815 | mg/kg | 0.10 | < 0.10 | < 0.10 |

# Results - Single Stage WAC

**Project: 18-1301 Ballymany Newbridge**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-36299 | | | | **Landfilll Waste Acceptance Criteria Limits** | | |
| **Chemtest Sample ID:** | 727491 | | | | | | |
| **Sample Ref:** | ES1 | | | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| **Sample ID:** | | | | | | | |
| **Sample Location:** | BH01 | | | | | | |
| **Top Depth(m):** | 0.5 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Nov-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | | | |
| Total Organic Carbon | 2625 | U | % | 0.46 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 1.2 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 9.0 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.13 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0017 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | < 0.0010 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.17 | 1.7 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 2.0 | 20 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 44 | 440 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | 0.050 | 0.50 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 6.7 | 67 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 7.9 |

## Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

# Results - Single Stage WAC

**Project: 18-1301 Ballymany Newbridge**

| | |
|---|---|
| **Chemtest Job No:** | 18-36299 |
| **Chemtest Sample ID:** | 727496 |
| **Sample Ref:** | ES2 |
| **Sample ID:** | |
| **Sample Location:** | BH03 |
| **Top Depth(m):** | 1.0 |
| **Bottom Depth(m):** | |
| **Sampling Date:** | 13-Nov-2018 |

| | | | | | **Landfill Waste Acceptance Criteria Limits** | | |
|---|---|---|---|---|---|---|---|
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.63 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 1.4 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.7 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.11 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0042 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | < 0.0010 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.2 | 12 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.19 | 1.9 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 4.2 | 42 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 78 | 780 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 49 | 490 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 11 |

## Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

# Report Information

**Key**

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

**Sample Deviation Codes**

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

**Sample Retention and Disposal**

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

CAUSEWAY
GEOTECH

# APPENDIX E

# SPT HAMMER ENERGY MEASUREMENT REPORT

**Southern Testing**
Environmental & Geotechnical

# SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

**Neil Burrows**
**Southern Testing Laboratories**
**Unit 11**
**Charlwoods Road**
**East Grinstead**
**RH19 2HU**

SPT Hammer Ref: DR14
Test Date: 14/04/2018
Report Date: 15/04/2018
File Name: DR14.spt
Test Operator: CAUSEWAY

---

## Instrumented Rod Data

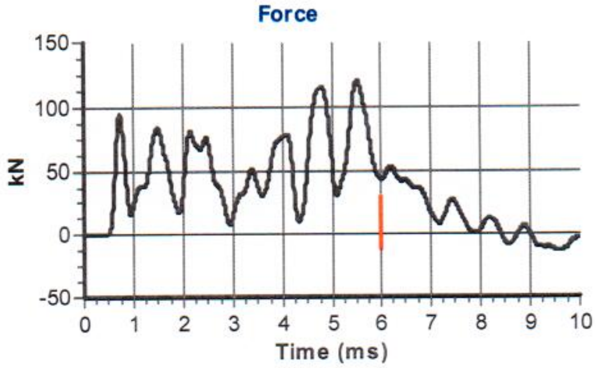
Diameter $d_r$ (mm): 54
Wall Thickness $t_r$ (mm): 6.0
Assumed Modulus $E_a$ (GPa): 200
Accelerometer No.1: 6458
Accelerometer No.2: 9607

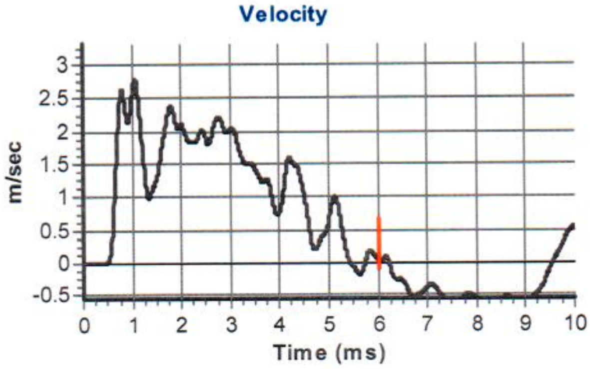
## SPT Hammer Information

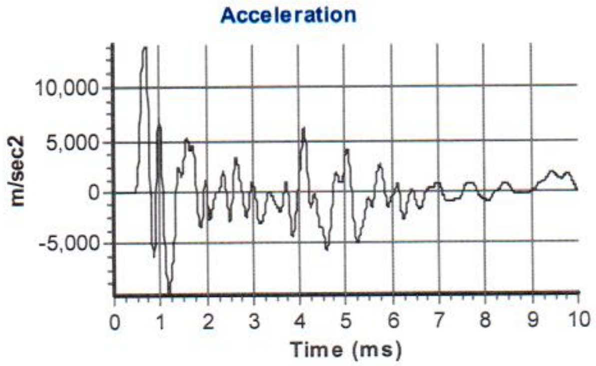
Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
SPT String Length L (m): 10.0

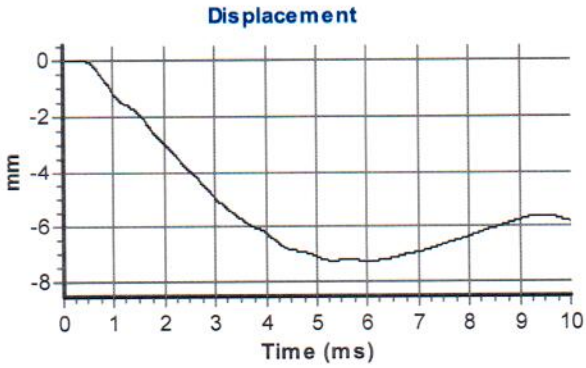
## Comments / Location

Causeway Yard


Force


Velocity


Acceleration


Displacement

## Calculations

Area of Rod A (mm2): 905
Theoretical Energy $E_{theor}$ (J): 473
Measured Energy $E_{meas}$ (J): 302

**Energy Ratio $E_r$ (%): 64**

NPBurrows

Signed: N P Burrows
Title: Field Operations Manager

The recommended calibration interval is 12 months

Curragh Manor,
Ballymany,
Newbridge
Co. Kildare

# Ground Investigation Report (Factual)

Project No. 23158

April 2021

M7 Business Park
Naas
Co. Kildare
Ireland

T: +353 (45) 846176
E: info@igsl.ie
W: www.igsl.ie

## DOCUMENT ISSUE REGISTER

| Distribution | Report Status | Rev | Date of Issue | Author | Reviewer |
|---|---|---|---|---|---|
| AGL | PDF by email | 0 | 28.4.2021 | J. Condon BSc MSc | P. Quigley BEng CEng MIEMICE FGS RoGEP Adviser |
| | | | | | |
| | | | | | |

## TABLE OF CONTENTS

## FIGURES

## TABLES

## APPENDICES

## FOREWORD

The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

### Standards

The ground investigation works for this project (Curragh Manor, Ballymany, Newbridge, Co. Kildare) have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as Engineers Ireland Specification for Ground Investigation (2nd Ed, 2016), BS 5930 (2015) and BS 1377 (Parts 1 to 9) and the following European Norms:

- EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- EN ISO 14688-1:2002 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- EN ISO 14688-2:2004 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Classification Principles
- EN ISO 14689-1:2004 Geotechnical Investigation and Testing - Identification & Classification of Rock, Part 1: Identification & Description

### Reporting

No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations. The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points. Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction, mining works or karstification below or close to the site.

This report has been prepared for AGL Consulting Engineers and the information should not be used without their prior written permission. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.

### Boring Procedures

Where required, 'shell and auger' or cable percussive boring technique is employed as defined by Section 6.3 of IS EN ISO 22475-1:2006. The boring operations, sampling and in-situ testing meet with the recommendations set out in IS EN 1997-2:2007 and BS 1377:1990 and EN ISO 22476-3:2005. The shell and auger boring technique allows for continuous sampling in clay and silt above the water table and sand and gravel below the water table (Table 2 of IS EN ISO 22475-1:2006).

It is highlighted that some disturbance and variation is unavoidable in particular ground (e.g. blowing sands, gravel / cobble dominant glacial deposits etc). Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

### In-Situ Testing

Where required, Standard Penetration Tests (SPT's) are conducted strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio ($E_r$). A calibration certificate is available upon request. The $E_r$ is defined as the ratio of the actual energy $E_{meas}$ (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy ($E_{theor}$) as calculated from the drive weight assembly. The measured number of blows (N) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

**Soil Sampling**
Three categories of sampling methods are outlined in EN ISO 22475-1:2006. The categories are referenced A, B and C for any given ground conditions and are shown in Tables 1 and 2 of EN ISO 22475-1:2006. Reference should be made to EN 1997-2:2002 for guidelines on sample class and quality for strength and compressibility testing. Samples of quality classes 1 or 2 can only be obtained by using Category A sampling methods.

Class 1 thin wall undisturbed tube samples (UT100) were obtained in fine grained soils and strictly meet the requirements of EN 1997-2:2002 and EN ISO 22475-1:2006. Soil samples for laboratory tests are divided into five classes with respect to the soil properties that are assumed to remain unchanged during sampling, handling transport and storage. The minimum sample quality required for testing purposes to Eurocode 7 compatibility (EN 1997-2:2002) is shown in Table A.

**Table A – Details of Sample Quality Requirements**

| EN 1997 Clause | Test | Minimum Sample Quality Class |
|---|---|---|
| 5.5.3 | Water Content | 3 |
| 5.5.4 | Bulk Density | 2 |
| 5.5.5 | Particle Density | N/S |
| 5.5.6 | Particle Size Analysis | N/S |
| 5.5.7 | Consistency Limits | 4 |
| 5.5.8 | Density Index | N/S |
| 5.5.9 | Soil Dispersivity | N/S |
| 5.5.10 | Frost Susceptibility | N/S |
| 5.6.2 | Organic Content | 4 |
| 5.6.3 | Carbonate Content | 3 |
| 5.6.4 | Sulphate Content | 3 |
| 5.6.5 | pH | 3 |
| 5.6.6 | Chloride Content | 3 |
| 5.7 | Strength Index | 1 |
| 5.8 | Strength Tests | 1 |
| 5.9 | Compressibility Tests | 1 |
| 5.10 | Compaction Tests | N/S |
| 5.11 | Permeability | 2 |

N/S – not stated. Presume a representative sample of appropriate size.

Samples recovered from trial pits or trenches meet the requirements of IS EN ISO 22475-1. It is highlighted that unforeseen circumstances such as variations in geological strata may lead to lower quality sample classes being obtained.

**Groundwater**
The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible, drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

### Engineering Logging

Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2002 and IS EN ISO 14689-1:2004. Rock weathering classification conforms to IS EN ISO 14689-1:2003 while discontinuities (bedding planes, joints, cleavages, faults etc) are classified in accordance with 4.3.3 of IS EN ISO 14689-1:2003. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

Where peat has been encountered, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 and Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986.

### Retention of Samples

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material will be discarded. Unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

# 1. INTRODUCTION

At the instruction of AGL Consulting and on behalf of Neville Homes, IGSL has undertaken a programme of ground investigations at Curragh Manor, Ballymany, Newbridge, Co. Kildare. A new residential development is planned for the site which is located to the south west of Newbridge town centre off the R445. An internal link road is proposed connecting the R445 Ballymany Road with the Sandhouse Road at the northern end of the site.

The ground investigation works for the new road included trial pits and dynamic probes followed by surveying of the 'as-built' exploratory locations. The works were executed in accordance with BS 5930, Code of Practice for Site Investigations (2015) and EN 1997-2 Eurocode 7 Part 2 Ground Investigation & Testing. The fieldworks were supervised by an IGSL engineering geologist.

Geotechnical and chemical laboratory analysis was carried out on a range of samples retrieved from the trial pits. The geotechnical testing included classification tests (moisture content, Atterberg Limits and particle size distributions), MCV CBR and compaction. Chemical analyses tests were performed on samples to determine sulphur, sulphate, chloride and nitrate contents. This report presents the results of the field and laboratory results and includes a drawing of the 'as-built' exploratory locations.

**Figure 1 – Site Location**

## 2. FIELDWORKS

### 2.1 General

The fieldworks were undertaken during March 2021 and comprised the following:

- Trial pits (8 No.)
- Dynamic probes (8 No.)
- Surveying of Exploratory Hole Locations

### 2.2 Trial Pits

Prior to excavation works commencing the area was scanned (Cat & Jenny) for the potential presence of service / utility ducts. Trial pitting was performed at eight locations using an 13T tracked excavator (supplied by the Client).

The pits are denoted TP 101 to 108 and extended to depths of between 3.0 and 4.5m bgl. The pits were logged and sampled by an IGSL engineering geologist in accordance with BS 5930 (2015) and the AGL specification. Bulk disturbed samples (typically 20 to 25 kg) were taken as the pits progressed. Stockpile samples were taken from two locations (denoted SP01) as directed by an AGL representative. The samples were placed in heavy-duty polyethylene bags and sealed before being transported to Naas for laboratory testing.

The trial pits were backfilled with the as-dug arisings and reinstated to the satisfaction of IGSL's site representative. The trial pit logs and photos are presented in Appendix 1 and include descriptions of the soils encountered, groundwater conditions and stability of the pit sidewalls.

### 2.3 Dynamic Probes

In-situ heavy dynamic probing (50kg hammer) was undertaken using a Terrier crawler rig. This unit meets the requirements of BS 1377, Part 9 (1990) and IS EN 1997-2:2007. The probing rig utilized a 50kg drop weight and 500mm drop height with a 60° cone. In accordance with the standards, the number of blows required to drive the cone each 100mm increment into the sub-soil was recorded. Probing is generally terminated when blow counts, $N_{100}$ values, exceed 25, in order to avoid damage to equipment. The probe records are presented in Appendix 2 and include blow-counts in both numerical and graphical format.

### 2.4 Surveying of Exploratory Hole Locations

Following the exploratory works, surveying was carried out using GPS techniques. Co-ordinates (X, Y) were measured to Irish National Grid and ground levels (Z) established to Malin Head. The co-ordinates and ground levels are shown on the exploratory hole logs with locations shown on the exploratory hole plan in Appendix 5.

## 3. LABORATORY TESTING

Laboratory testing was undertaken on selected trial pit samples. The geotechnical testing was carried out in accordance with BS 1377 and included moisture content, particle size analysis, Atterberg limits (Liquid / Plastic Limits), MCV, CBR and compaction and the results are presented in Appendix 3. Chemical analysis tests (sulphate, sulphur, chloride, nitrate and ammonium) were performed on four trial pit samples and results are contained in Appendix 4.

# 4. GROUND CONDITIONS & GROUNDWATER

## 4.1 Ground Profile

The investigatory works have revealed the ground conditions at the proposed access road corridor to comprise:

- Made Ground
- Topsoil
- Glacial deposits

## 4.2 Superficial Deposits

### Anthropogenic Soils (Made Ground)

MADE GROUND (anthropogenic soil) was found in TP's 101, 102, 103 and 104 respectively. It extends from depths of 0.5m in TP 101 to 1.30m in TP 102 and largely consists of re-worked silty sand or gravel with sandy gravelly clay / silt. The made ground matrix varies from low strength (soft) to medium strength (firm).

**Figure 2 - Images showing Made Ground in Trial Pits**

**TP 102** **TP 104**

### Glacial Deposits

Glacial deposits were encountered in each of the trial pits and are dominated by slightly gravelly silty fine SAND, silty very sandy GRAVEL and sandy gravelly SILT. The excavations demonstrate a high degree of heterogeneity and this is not untypical of fluvioglacial deposits in the Curragh area where rapid changes in stratification occur. The Atterberg Limit tests show that the majority of the samples tested are non-plastic with a small number designated as being of low plasticity (CL). The dynamic probes show that the soils are generally firm / stiff or compact (medium dense). Images illustrating the composition of the glacial deposits are shown in Figure 3.

## Figure 3 – Images Showing Glacial Deposits in Trial Pits

### TP 101

### TP 103

**TP 105**

**TP 107**

### 4.3 Groundwater

Groundwater was only encountered in TP 102 and TP 104 with the remainder noted as dry during excavation works. Summary details are shown in Table 1. Sidewall stability was good with little or no undermining observed.

**Table 1 – Summary Details of Groundwater Conditions during Trial Pitting**

| TP No | Final Depth (m) | Groundwater Strike (m) | Inflow Conditions | Sidewall Stability |
|---|---|---|---|---|
| TP 101 | 3.00 (103.48m OD) | Dry | | Stable |
| TP 102 | 3.70 (100.40m OD) | 0.60 | Seepage | Stable |
| TP 103 | 4.00 (100.72m OD) | Dry | | Stable |
| TP 104 | 4.40 (98.11m OD) | 0.40 | Moderate | Stable |
| TP 105 | 4.00 (97.0m OD) | Dry | | Stable |
| TP 106 | 4.00 (96.48m OD) | Dry | | Stable |
| TP 107 | 4.50 (95.57m OD) | Dry | | Stable |
| TP 108 | 3.30 (95.41m OD) | Dry | | Stable |

## REFERENCES

**1.0** BS 5930 (2015) Code of Practice for Site Investigation, British Standards Institution (BSI).

**2.0** BS 1377 (1990) Methods of Testing of Soils for Civil Engineering Purposes, BSI

**3.0** Eurocode 7, Part 2: Ground Investigation & Testing (EN 1997-2:2007)

**4.0** IS EN 14689-1-2018: Geotechnical Investigation & Testing – Identification and Classification of Soil

**5.0** Site Investigation Practice: Assessing BS 5930 (1986), Geological Society Special Publication, No. 2.

# Appendix 1

## Trial Pit Records & Photographs

# TRIAL PIT RECORD

| | |
|---|---|
| **REPORT NUMBER** | 23158 |
| **CONTRACT** | Ballymany, Newbridge - Ground Investigation for Road |
| **TRIAL PIT NO.** | **SP01** |
| **SHEET** | Sheet 1 of 1 |
| **LOGGED BY** | JC |
| **CO-ORDINATES** | 679,152.10 E<br>713,753.65 N |
| **GROUND LEVEL (m)** | 108.34 |
| **DATE STARTED** | 15/03/2021 |
| **DATE COMPLETED** | 15/03/2021 |
| **CLIENT** | Anthony Neville Homes Ltd |
| **ENGINEER** | Muir associates / AGL |
| **EXCAVATION METHOD** | 13T tracked machine |

| | Geotechnical Description | Legend | Depth (m) | Elevation | Water Strike | Samples | | | Vane Test (KPa) | Hand Penetrometer (KPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Ref | Type | Depth | | |
| 0.0 | | | | | | | | | | |
| | | | | | | 157311<br>157312<br>157313<br>157314 | LB<br>LB<br>LB<br>LB | 0.90-1.00<br>0.90-1.00<br>0.90-1.00<br>0.90-1.00 | | |
| 1.0 | | | | | | | | | | |
| 2.0 | | | | | | | | | | |
| 3.0 | | | | | | | | | | |
| 4.0 | | | | | | | | | | |

**Groundwater Conditions**

**Stability**
Stable

**General Remarks**

# TRIAL PIT RECORD

**REPORT NUMBER** 23158

| | | | |
|---|---|---|---|
| **CONTRACT** | Ballymany, Newbridge - Ground Investigation for Road | **TRIAL PIT NO.** | **SP02** |
| | | **SHEET** | Sheet 1 of 1 |
| **LOGGED BY** | JC | **DATE STARTED** | 15/03/2021 |
| **CO-ORDINATES** | 679,103.92 E<br>713,964.14 N | **DATE COMPLETED** | 15/03/2021 |
| **GROUND LEVEL (m)** | 108.34 | **EXCAVATION METHOD** | 13T tracked machine |
| **CLIENT** | Anthony Neville Homes Ltd | | |
| **ENGINEER** | Muir associates / AGL | | |

| | Geotechnical Description | Legend | Depth (m) | Elevation | Water Strike | Samples: Sample Ref | Samples: Type | Samples: Depth | Vane Test (KPa) | Hand Penetrometer (KPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | | | | | | | | | | |
| 1.0 | | | | | | 157307<br>157308<br>157309<br>157310 | LB<br>LB<br>LB<br>LB | 0.90-1.00<br>0.90-1.00<br>0.90-1.00<br>0.90-1.00 | | |
| 2.0 | | | | | | | | | | |
| 3.0 | | | | | | | | | | |
| 4.0 | | | | | | | | | | |

**Groundwater Conditions**

**Stability**
Stable

**General Remarks**

# TRIAL PIT RECORD

**REPORT NUMBER** 23158

| | | | |
|---|---|---|---|
| **CONTRACT** | Ballymany, Newbridge - Ground Investigation for Road | **TRIAL PIT NO.** | **TP101** |
| | | **SHEET** | Sheet 1 of 1 |
| **LOGGED BY** | JC | **DATE STARTED** | 15/03/2021 |
| **CO-ORDINATES** | 679,150.73 E<br>713,721.05 N | **DATE COMPLETED** | 15/03/2021 |
| **GROUND LEVEL (m)** | 106.48 | **EXCAVATION METHOD** | 13T tracked machine |
| **CLIENT** | Anthony Neville Homes Ltd | | |
| **ENGINEER** | Muir associates / AGL | | |

| | Geotechnical Description | Legend | Depth (m) | Elevation | Water Strike | Samples | | | Vane Test (KPa) | Hand Penetrometer (KPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Ref | Type | Depth | | |
| 0.0 | MADE GROUND comprising brown slightly silty fine SAND. | ▩ | 0.50 | 105.98 | | | | | | |
| 1.0<br>2.0 | Very compact (dense) brown sandy SILT | × | 3.00 | 103.48 | | 140476<br>140477<br>140478 | B<br>B<br>B | 0.50-0.60<br>1.50-1.60<br>2.50-2.60 | | |
| 3.0<br>4.0 | End of Trial Pit at 3.00m | | | | | | | | | |

**Groundwater Conditions**

**Stability**
Stable

**General Remarks**

# TRIAL PIT RECORD

**REPORT NUMBER** 23158

| | | | |
|---|---|---|---|
| **CONTRACT** | Ballymany, Newbridge - Ground Investigation for Road | **TRIAL PIT NO.** | **TP102** |
| | | **SHEET** | Sheet 1 of 1 |
| **LOGGED BY** | JC | **DATE STARTED** | 15/03/2021 |
| **CO-ORDINATES** | 679,090.91 E<br>713,676.60 N | **DATE COMPLETED** | 15/03/2021 |
| **GROUND LEVEL (m)** | 104.10 | **EXCAVATION METHOD** | 13T tracked machine |
| **CLIENT** | Anthony Neville Homes Ltd | | |
| **ENGINEER** | Muir associates / AGL | | |

| | Geotechnical Description | Legend | Depth (m) | Elevation | Water Strike | Samples: Sample Ref | Samples: Type | Samples: Depth | Vane Test (KPa) | Hand Penetrometer (KPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | MADE GROUND comprised of uncompact (loose) brown silty sandy Gravel. Sand is fine to coarse. Gravel is fine to coarse, subrounded to angular. | ▨ | 0.10 | 104.00 | | | | | | |
| | MADE GROUND comprised of firm brown slightly silty very gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded to angular. | ▨ | 0.70 | 103.40 | 1 ▼ (Seepage) | 140482 | B | 0.50-0.60 | | |
| 1.0 | MADE GROUND comprised of soft / firm reddish brown slightly sandy gravelly SILT. Sand is fine. Gravel is fine to medium and angular. | ▨ | 1.30 | 102.80 | | | | | | |
| 2.0 | Compact greyish brown slightly sandy gravelly SILT / sandy GRAVEL Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular. | | 2.20 | 101.90 | | 140483 | B | 1.50-1.60 | | |
| 3.0 | Compact / very compact (dense) brown silty gravelly SAND / silty sandy GRAVEL. Sand is fine. Gravel is fine to coarse subrounded to subangular. | | 3.70 | 100.40 | | 140484<br>140485 | B<br>B | 2.50-2.60<br>3.50-3.60 | | |
| 4.0 | End of Trial Pit at 3.70m | | | | | | | | | |

**Groundwater Conditions**

**Stability**
Stable

**General Remarks**

# TRIAL PIT RECORD

**REPORT NUMBER** 23158

**CONTRACT** Ballymany, Newbridge - Ground Investigation for Road

**TRIAL PIT NO.** TP103

**SHEET** Sheet 1 of 1

**LOGGED BY** JC

**CO-ORDINATES** 679,068.13 E
713,695.04 N

**GROUND LEVEL (m)** 104.72

**DATE STARTED** 15/03/2021

**DATE COMPLETED** 15/03/2021

**CLIENT** Anthony Neville Homes Ltd

**ENGINEER** Muir associates / AGL

**EXCAVATION METHOD** 13T tracked machine

| | Geotechnical Description | Legend | Depth (m) | Elevation | Water Strike | Samples | | | Vane Test (KPa) | Hand Penetrometer (KPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Ref | Type | Depth | | |
| 0.0 | MADE GROUND comprised of soft / firm brown sandy gravelly CLAY/SILT. Sand is fine to coarse. Gravel is fine to coarse subrounded to angular. | ▨ | 0.80 | 103.92 | | | | | | |
| 1.0 | Firm (compact) greyish brown slightly gravelly sandy SILT. Sand is fine to medium. Gravel is fine to medium, subangular to angular. | ▨ | 1.80 | 102.92 | | 140490 | B | 0.90-1.00 | | |
| 2.0 | Firm (conpact) reddish brown sandy gravelly SILT. Sand is fine to medium. Gravel is fine to medium and angular. | ▨ | 2.40 | 102.32 | | 140491 | B | 1.90-2.00 | | |
| 3.0 | Very compact (demse) brown gravelly silty SAND. Sand is fine. Gravel is fine to medium, subrounded to angular. | ▨ | 4.00 | 100.72 | | 140492 | B | 2.90-3.00 | | |
| 4.0 | End of Trial Pit at 4.00m | | | | | | | | | |

**Groundwater Conditions**

**Stability**
Stable

**General Remarks**

# TRIAL PIT RECORD

**REPORT NUMBER** 23158

**CONTRACT** Ballymany, Newbridge - Ground Investigation for Road

**TRIAL PIT NO.** TP104
**SHEET** Sheet 1 of 1

**LOGGED BY** JC

**CO-ORDINATES** 679,029.90 E 713,765.61 N

**GROUND LEVEL (m)** 102.41

**DATE STARTED** 15/03/2021
**DATE COMPLETED** 15/03/2021

**CLIENT** Anthony Neville Homes Ltd
**ENGINEER** Muir associates / AGL

**EXCAVATION METHOD** 13T tracked machine

| | Geotechnical Description | Legend | Depth (m) | Elevation | Water Strike | Samples | | | Vane Test (KPa) | Hand Penetrometer (KPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Ref | Type | Depth | | |
| 0.0 | MADE GROUND comprised of compact brown silty sandy Gravel. Sand is fine to medium. Gravel is fine to medium, subrounded to subangular. | | 0.20 | 102.21 | | | | | | |
| | MADE GROUND comprised of stiff grey slightly gravelly sandy CLAY. Sand is fine. Gravel is fine to medium and angular. | | 1.00 | 101.41 | 1 (Moderate) | 140496 | B | 0.50-0.60 | | |
| 1.0 | Firm reddish brown slightly gravelly sandy SILT / CLAY. Sand is fine. Gravel is fine to medium and angular. | | 1.80 | 100.61 | | 140497 | B | 1.50-1.60 | | |
| 2.0<br>3.0 | Firm brown sandy very gravelly SILT. Sand is fine. Gravel is fine to medium and angular. | | 4.00 | 98.41 | | 140498 | B | 2.50-2.60 | | |
| 4.0 | Firm brown slightly sandy gravelly SILT. Sand is fine to medium. Gravel is fine to coarse, subrounded to subangular. | | 4.30 | 98.11 | | 140499 | B | 4.20-4.30 | | |
| | End of Trial Pit at 4.30m | | | | | | | | | |

**Groundwater Conditions**

**Stability**
Stable

**General Remarks**

# TRIAL PIT RECORD

**REPORT NUMBER** 23158

| | | | |
|---|---|---|---|
| **CONTRACT** | Ballymany, Newbridge - Ground Investigation for Road | **TRIAL PIT NO.** | **TP105** |
| | | **SHEET** | Sheet 1 of 1 |
| **LOGGED BY** | JC | **DATE STARTED** | 15/03/2021 |
| **CO-ORDINATES** | 678,936.52 E<br>713,860.74 N | **DATE COMPLETED** | 15/03/2021 |
| **GROUND LEVEL (m)** | 101.04 | **EXCAVATION METHOD** | 13T tracked machine |
| **CLIENT** | Anthony Neville Homes Ltd | | |
| **ENGINEER** | Muir associates / AGL | | |

| | Geotechnical Description | Legend | Depth (m) | Elevation | Water Strike | Samples | | | Vane Test (KPa) | Hand Penetrometer (KPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Ref | Type | Depth | | |
| 0.0 | TOPSOIL | | 0.20 | 100.84 | | | | | | |
| | Stiff brown slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to medium and angular. | | 1.10 | 99.94 | | 157301 | B | 0.50-0.60 | | |
| 1.0 | Stiff light brown sandy gravelly SILT with low cobble content. Sand is fine. Gravel is fine and angular. | | 2.50 | 98.54 | | 157302 | B | 1.50-1.60 | | |
| 2.0<br>3.0 | Compact grey brown very sandy GRAVEL. Sand is fine to medium. Gravel is fine to coarse, subrounded to subangular. | | 4.00 | 97.04 | | 157303 | B | 3.50-3.60 | | |
| 4.0 | End of Trial Pit at 4.00m | | | | | | | | | |

**Groundwater Conditions**

**Stability**
Stable

**General Remarks**

# TRIAL PIT RECORD

**REPORT NUMBER** 23158

|  |  |  |  |
|---|---|---|---|
| **CONTRACT** | Ballymany, Newbridge - Ground Investigation for Road | **TRIAL PIT NO.** | **TP106** |
|  |  | **SHEET** | Sheet 1 of 1 |
| **LOGGED BY** | JC | **DATE STARTED** | 15/03/2021 |
| **CO-ORDINATES** | 678,875.18 E<br>713,965.04 N | **DATE COMPLETED** | 15/03/2021 |
| **GROUND LEVEL (m)** | 100.48 | **EXCAVATION METHOD** | 13T tracked machine |
| **CLIENT** | Anthony Neville Homes Ltd |  |  |
| **ENGINEER** | Muir associates / AGL |  |  |

|  | Geotechnical Description | Legend | Depth (m) | Elevation | Water Strike | Samples |  |  | Vane Test (KPa) | Hand Penetrometer (KPa) |
|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  | Sample Ref | Type | Depth |  |  |
| 0.0 | TOPSOIL |  |  |  |  |  |  |  |  |  |
| 1.0 | Stiff brown slightly gravelly sandy CLAY. Sand is fine. Gravel is fine to medium and angular. |  | 0.20 | 100.28 |  | 145493 | B | 0.50-0.60 |  |  |
| 2.0 | Stiff light brown slightly sandy gravelly SILT. Sand is fine. Gravel is fine to medium and angular. |  | 1.50 | 98.98 |  | 145494 | B | 1.60-1.70 |  |  |
| 3.0 | Very compact brown slightly gravelly silty SAND. Sand is fine. Gravel is fine to medium and subangular. |  | 2.90 | 97.58 |  | 145495 | B | 3.50-3.60 |  |  |
| 4.0 | End of Trial Pit at 4.00m |  | 4.00 | 96.48 |  |  |  |  |  |  |

**Groundwater Conditions**

**Stability**
Stable

**General Remarks**

# TRIAL PIT RECORD

**REPORT NUMBER** 23158

| | | | |
|---|---|---|---|
| **CONTRACT** | Ballymany, Newbridge - Ground Investigation for Road | **TRIAL PIT NO.** | **TP107** |
| | | **SHEET** | Sheet 1 of 1 |
| **LOGGED BY** | JC | **DATE STARTED** | 15/03/2021 |
| **CO-ORDINATES** | 678,792.21 E<br>714,099.75 N | **DATE COMPLETED** | 15/03/2021 |
| **GROUND LEVEL (m)** | 100.07 | **EXCAVATION METHOD** | 13T tracked machine |
| **CLIENT** | Anthony Neville Homes Ltd | | |
| **ENGINEER** | Muir associates / AGL | | |

| | Geotechnical Description | Legend | Depth (m) | Elevation | Water Strike | Samples | | | Vane Test (KPa) | Hand Penetrometer (KPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Ref | Type | Depth | | |
| 0.0 | TOPSOIL | | 0.20 | 99.87 | | | | | | |
| | Firm / stiff brown slightly sandy slightly gravelly SILT. Sand is fine to medium. Gravel is fine to medium, angular to very angular. | | 1.50 | 98.57 | | 145479 | B | 0.50-0.60 | | |
| 1.0 | | | | | | 145480<br>145481 | LB<br>LB | 1.20-1.40<br>1.20-1.40 | 48<br>54<br>72<br>68<br>50<br>64 | |
| | Compact / very compact brown slightly gravelly silty SAND. Sand is fine to medium. | | 4.50 | 95.57 | | 145482 | B | 1.70-1.80 | | |
| 2.0 | | | | | | | | | | |
| 3.0 | | | | | | | | | | |
| 4.0 | | | | | | 145483 | B | 4.20-4.30 | | |
| | End of Trial Pit at 4.50m | | | | | | | | | |

**Groundwater Conditions**

**Stability**
Stable

**General Remarks**

# TRIAL PIT RECORD

**REPORT NUMBER** 23158

| | | | |
|---|---|---|---|
| **CONTRACT** | Ballymany, Newbridge - Ground Investigation for Road | **TRIAL PIT NO.** | **TP108** |
| | | **SHEET** | Sheet 1 of 1 |
| **LOGGED BY** | JC | **DATE STARTED** | 15/03/2021 |
| **CO-ORDINATES** | 678,722.56 E<br>714,223.41 N | **DATE COMPLETED** | 15/03/2021 |
| **GROUND LEVEL (m)** | 98.71 | **EXCAVATION METHOD** | 13T tracked machine |
| **CLIENT** | Anthony Neville Homes Ltd | | |
| **ENGINEER** | Muir associates / AGL | | |

| | Geotechnical Description | Legend | Depth (m) | Elevation | Water Strike | Samples: Sample Ref | Samples: Type | Samples: Depth | Vane Test (KPa) | Hand Penetrometer (KPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | TOPSOIL | | | | | | | | | |
| | Firm reddish brown slightly sandy gravelly SILT. Sand is fine. Gravel is fine to medium and angular. | | 0.20 | 98.51 | | 145487 | B | 0.50-0.60 | | |
| 1.0 | Firm light brown slightly sandy slightly gravelly SILT. Sand is fine. Gravel is fine to medium and angular. | | 0.80 | 97.91 | | 145488 | B | 1.30-1.40 | 56<br>54<br>70<br>62<br>66<br>58 | |
| 2.0<br>3.0 | Stiff / very stiff light brown slightly sandy slightly gravelly SILT. Sand is fine. Gravel is fine to medium and angular. | | 1.50 | 97.21 | | 145489 | B | 3.00-3.10 | | |
| 4.0 | End of Trial Pit at 3.30m | | 3.30 | 95.41 | | | | | | |

**Groundwater Conditions**

**Stability**
Stable

**General Remarks**

# Curragh Farm, Ballymany, Newbridge – Trial Pit Images

**TP 101 – Sidewall Views**

**TP 101 - Stockpile**

**TP 102 – Sidewall View**

**TP 102 – Sidewall View**

*TP 102 – Stockpile*

*TP103 – Sidewall View*

*TP103 – Sidewall View*

*TP103 – Stockpile*

*TP104 – Sidewall View*

*TP104 - Sidewall View*

*TP104 - Stockpile*

*TP105 – Sidewall View*

*TP105 – Sidewall Views*

*TP105 – Stockpile*

**TP 106 – Sidewall Views**

*TP106 – Sidewall View*

*TP106 - Stockpile*

*TP107 – Sidewall View*

*TP107- Stockpile*

TP108 – Sidewall Views

*TP108 - Stockpile*

# Appendix 2

# Dynamic Probe Records

# DYNAMIC PROBE RECORD

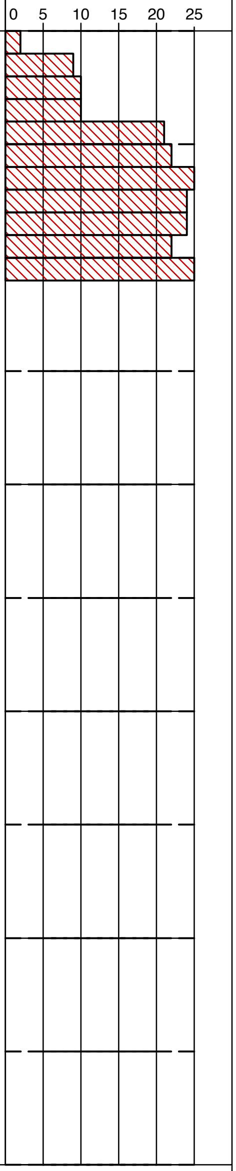
**REPORT NUMBER** 23158

| | | | |
|---|---|---|---|
| **CONTRACT** | Ballymany , Newbridge , Co.Kildare | **PROBE NO.** | **DP101** |
| | | **SHEET** | Sheet 1 of 1 |
| **CO-ORDINATES** | 679,150.12 E<br>713,718.14 N | **DATE DRILLED** | 15/03/2021 |
| **GROUND LEVEL (mOD)** | 106.57 | **DATE LOGGED** | 15/03/2021 |
| **CLIENT** | Anthony Neville Homes Ltd | **PROBE TYPE** | DPH |
| **ENGINEER** | AGL Consulting | | |
| **HAMMER MASS (kg)** | 50 | | |
| **INCREMENT SIZE (mm)** | 100 | | |
| **FALL HEIGHT (mm)** | 500 | | |

| Depth (m) | Geotechnical Description | Legend | Depth (m) | Elevation (mOD) | Water |
|---|---|---|---|---|---|
| 0.0 | . | | | | |
| 1.0 | | | | | |
| | End of Probe at 1.10 m | | | 105.47 | |
| 2.0 | | | | | |
| 3.0 | | | | | |
| 4.0 | | | | | |

| Depth (m) | Probe Readings (Blows/Increment) |
|---|---|
| 0.00 | 2 |
| 0.10 | 9 |
| 0.20 | 10 |
| 0.30 | 10 |
| 0.40 | 21 |
| 0.50 | 22 |
| 0.60 | 25 |
| 0.70 | 24 |
| 0.80 | 24 |
| 0.90 | 22 |
| 1.00 | 25 |

Graphic Probe Record



**GROUNDWATER OBSERVATIONS**

**REMARKS**

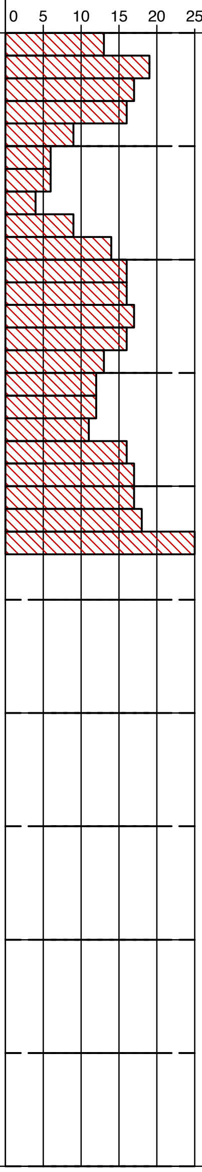
# DYNAMIC PROBE RECORD

| | |
|---|---|
| **REPORT NUMBER** | 23158 |
| **CONTRACT** | Ballymany , Newbridge , Co.Kildare |
| **PROBE NO.** | **DP102** |
| **SHEET** | Sheet 1 of 1 |
| **CO-ORDINATES** | 679,091.33 E<br>713,673.57 N |
| **GROUND LEVEL (mOD)** | 104.07 |
| **DATE DRILLED** | 15/03/2021 |
| **DATE LOGGED** | 15/03/2021 |
| **HAMMER MASS (kg)** | 50 |
| **INCREMENT SIZE (mm)** | 100 |
| **FALL HEIGHT (mm)** | 500 |
| **CLIENT** | Anthony Neville Homes Ltd |
| **ENGINEER** | AGL Consulting |
| **PROBE TYPE** | DPH |

| Depth (m) | Geotechnical Description | Legend | Depth (m) | Elevation (mOD) | Water |
|---|---|---|---|---|---|
| 0.0 | . | | | | |
| 2.30 | End of Probe at 2.30 m | | | 101.77 | |

| Depth (m) | Probe Readings (Blows/Increment) |
|---|---|
| 0.00 | 13 |
| 0.10 | 19 |
| 0.20 | 17 |
| 0.30 | 16 |
| 0.40 | 9 |
| 0.50 | 6 |
| 0.60 | 6 |
| 0.70 | 4 |
| 0.80 | 9 |
| 0.90 | 14 |
| 1.00 | 16 |
| 1.10 | 16 |
| 1.20 | 17 |
| 1.30 | 16 |
| 1.40 | 13 |
| 1.50 | 12 |
| 1.60 | 12 |
| 1.70 | 11 |
| 1.80 | 16 |
| 1.90 | 17 |
| 2.00 | 17 |
| 2.10 | 18 |
| 2.20 | 25 |

Graphic Probe Record



Depth (m): 0.0, 1.0, 2.0, 3.0, 4.0

**GROUNDWATER OBSERVATIONS**

**REMARKS**

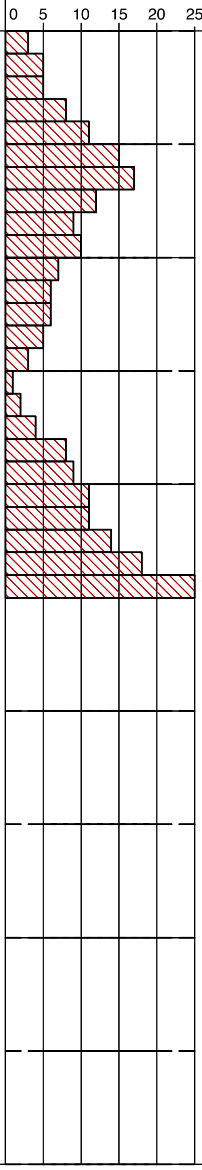
| | | |
|---|---|---|
| IGSL | **DYNAMIC PROBE RECORD** | **REPORT NUMBER**<br>23158 |

| | | | |
|---|---|---|---|
| **CONTRACT** | Ballymany , Newbridge , Co.Kildare | **PROBE NO.**<br>**SHEET** | **DP103**<br>Sheet 1 of 1 |
| **CO-ORDINATES** | 679,074.28 E<br>713,703.25 N | **DATE DRILLED**<br>**DATE LOGGED** | 15/03/2021<br>15/03/2021 |
| **GROUND LEVEL (mOD)** | 105.00 | | |
| **CLIENT** | Anthony Neville Homes Ltd | **PROBE TYPE** | DPH |
| **ENGINEER** | AGL Consulting | | |

| | |
|---|---|
| **HAMMER MASS (kg)** | 50 |
| **INCREMENT SIZE (mm)** | 100 |
| **FALL HEIGHT (mm)** | 500 |

| Depth (m) | Geotechnical Description | Legend | Depth (m) | Elevation (mOD) | Water | Depth (m) | Probe Readings (Blows/Increment) |
|---|---|---|---|---|---|---|---|
| 0.0 | . | | | | | 0.00 | 3 |
| | | | | | | 0.10 | 5 |
| | | | | | | 0.20 | 5 |
| | | | | | | 0.30 | 8 |
| | | | | | | 0.40 | 11 |
| | | | | | | 0.50 | 15 |
| | | | | | | 0.60 | 17 |
| | | | | | | 0.70 | 12 |
| | | | | | | 0.80 | 9 |
| | | | | | | 0.90 | 10 |
| 1.0 | | | | | | 1.00 | 7 |
| | | | | | | 1.10 | 6 |
| | | | | | | 1.20 | 6 |
| | | | | | | 1.30 | 5 |
| | | | | | | 1.40 | 3 |
| | | | | | | 1.50 | 1 |
| | | | | | | 1.60 | 2 |
| | | | | | | 1.70 | 4 |
| | | | | | | 1.80 | 8 |
| | | | | | | 1.90 | 9 |
| 2.0 | | | | | | 2.00 | 11 |
| | | | | | | 2.10 | 11 |
| | | | | | | 2.20 | 14 |
| | | | | | | 2.30 | 18 |
| | | | | | | 2.40 | 25 |
| | End of Probe at 2.50 m | | | 102.50 | | | |
| 3.0 | | | | | | | |
| 4.0 | | | | | | | |

Graphic Probe Record



**GROUNDWATER OBSERVATIONS**

**REMARKS**

# DYNAMIC PROBE RECORD

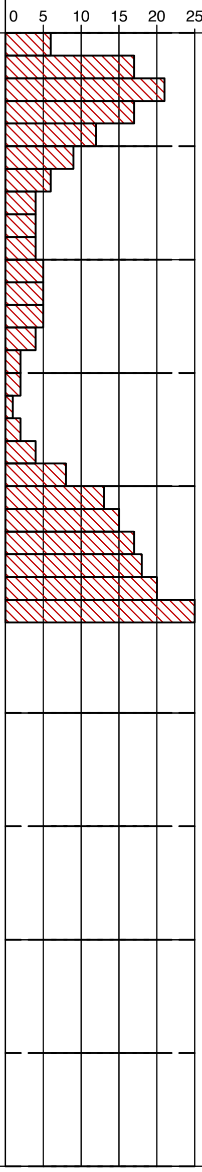
**REPORT NUMBER** 23158

| | | | |
|---|---|---|---|
| **CONTRACT** | Ballymany , Newbridge , Co.Kildare | **PROBE NO.** | **DP104** |
| | | **SHEET** | Sheet 1 of 1 |
| **CO-ORDINATES** | 679,035.89 E<br>713,765.11 N | **DATE DRILLED** | 15/03/2021 |
| **GROUND LEVEL (mOD)** | 102.68 | **DATE LOGGED** | 15/03/2021 |
| **CLIENT** | Anthony Neville Homes Ltd | **PROBE TYPE** | DPH |
| **ENGINEER** | AGL Consulting | | |
| **HAMMER MASS (kg)** | 50 | | |
| **INCREMENT SIZE (mm)** | 100 | | |
| **FALL HEIGHT (mm)** | 500 | | |

| Depth (m) | Geotechnical Description | Legend | Depth (m) | Elevation (mOD) | Water |
|---|---|---|---|---|---|
| 0.0 | . | | | | |
| 2.60 | End of Probe at 2.60 m | | | 100.08 | |

| Depth (m) | Probe Readings (Blows/Increment) |
|---|---|
| 0.00 | 6 |
| 0.10 | 17 |
| 0.20 | 21 |
| 0.30 | 17 |
| 0.40 | 12 |
| 0.50 | 9 |
| 0.60 | 6 |
| 0.70 | 4 |
| 0.80 | 4 |
| 0.90 | 4 |
| 1.00 | 5 |
| 1.10 | 5 |
| 1.20 | 5 |
| 1.30 | 4 |
| 1.40 | 2 |
| 1.50 | 2 |
| 1.60 | 1 |
| 1.70 | 2 |
| 1.80 | 4 |
| 1.90 | 8 |
| 2.00 | 13 |
| 2.10 | 15 |
| 2.20 | 17 |
| 2.30 | 18 |
| 2.40 | 20 |
| 2.50 | 25 |

Graphic Probe Record



Depth (m): 0.0, 1.0, 2.0, 3.0, 4.0

**GROUNDWATER OBSERVATIONS**

**REMARKS**

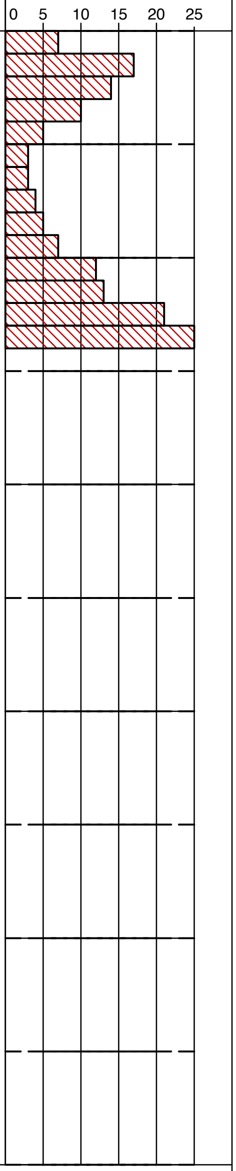
# DYNAMIC PROBE RECORD

**REPORT NUMBER** 23158

| | | | |
|---|---|---|---|
| **CONTRACT** | Ballymany , Newbridge , Co.Kildare | **PROBE NO.** | **DP105** |
| | | **SHEET** | Sheet 1 of 1 |
| **CO-ORDINATES** | 678,939.04 E<br>713,860.26 N | **DATE DRILLED** | 15/03/2021 |
| **GROUND LEVEL (mOD)** | 101.07 | **DATE LOGGED** | 15/03/2021 |
| **HAMMER MASS (kg)** | 50 | **PROBE TYPE** | DPH |
| **INCREMENT SIZE (mm)** | 100 | | |
| **FALL HEIGHT (mm)** | 500 | | |
| **CLIENT** | Anthony Neville Homes Ltd | | |
| **ENGINEER** | AGL Consulting | | |

| Depth (m) | Geotechnical Description | Legend | Depth (m) | Elevation (mOD) | Water | Depth (m) | Probe Readings (Blows/Increment) |
|---|---|---|---|---|---|---|---|
| 0.0 | . | | | | | 0.00 | 7 |
| | | | | | | 0.10 | 17 |
| | | | | | | 0.20 | 14 |
| | | | | | | 0.30 | 10 |
| | | | | | | 0.40 | 5 |
| | | | | | | 0.50 | 3 |
| | | | | | | 0.60 | 3 |
| | | | | | | 0.70 | 4 |
| | | | | | | 0.80 | 5 |
| | | | | | | 0.90 | 7 |
| 1.0 | | | | | | 1.00 | 12 |
| | | | | | | 1.10 | 13 |
| | | | | | | 1.20 | 21 |
| | | | | | | 1.30 | 25 |
| | End of Probe at 1.40 m | | | 99.67 | | | |
| 2.0 | | | | | | | |
| 3.0 | | | | | | | |
| 4.0 | | | | | | | |

Graphic Probe Record



**GROUNDWATER OBSERVATIONS**

**REMARKS**

# DYNAMIC PROBE RECORD

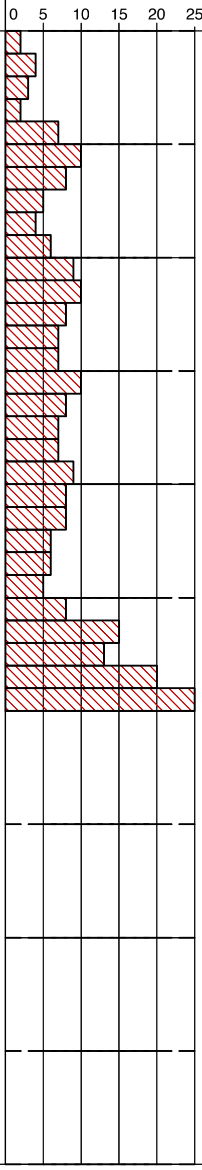
**REPORT NUMBER** 23158

| | | | |
|---|---|---|---|
| **CONTRACT** | Ballymany , Newbridge , Co.Kildare | **PROBE NO.** | **DP106** |
| | | **SHEET** | Sheet 1 of 1 |
| **CO-ORDINATES** | 678,877.62 E<br>713,962.34 N | **DATE DRILLED** | 15/03/2021 |
| **GROUND LEVEL (mOD)** | 100.54 | **DATE LOGGED** | 15/03/2021 |
| **HAMMER MASS (kg)** | 50 | **PROBE TYPE** | DPH |
| **INCREMENT SIZE (mm)** | 100 | | |
| **FALL HEIGHT (mm)** | 500 | | |
| **CLIENT** | Anthony Neville Homes Ltd | | |
| **ENGINEER** | AGL Consulting | | |

| Depth (m) | Geotechnical Description | Legend | Depth (m) | Elevation (mOD) | Water |
|---|---|---|---|---|---|
| 0.0 | . | | | | |
| 3.0 | End of Probe at 3.00 m | | | 97.54 | |

| Depth (m) | Probe Readings (Blows/Increment) |
|---|---|
| 0.00 | 2 |
| 0.10 | 4 |
| 0.20 | 3 |
| 0.30 | 2 |
| 0.40 | 7 |
| 0.50 | 10 |
| 0.60 | 8 |
| 0.70 | 5 |
| 0.80 | 4 |
| 0.90 | 6 |
| 1.00 | 9 |
| 1.10 | 10 |
| 1.20 | 8 |
| 1.30 | 7 |
| 1.40 | 7 |
| 1.50 | 10 |
| 1.60 | 8 |
| 1.70 | 7 |
| 1.80 | 7 |
| 1.90 | 9 |
| 2.00 | 8 |
| 2.10 | 8 |
| 2.20 | 6 |
| 2.30 | 6 |
| 2.40 | 5 |
| 2.50 | 8 |
| 2.60 | 15 |
| 2.70 | 13 |
| 2.80 | 20 |
| 2.90 | 25 |

Graphic Probe Record



**GROUNDWATER OBSERVATIONS**

**REMARKS**

# DYNAMIC PROBE RECORD

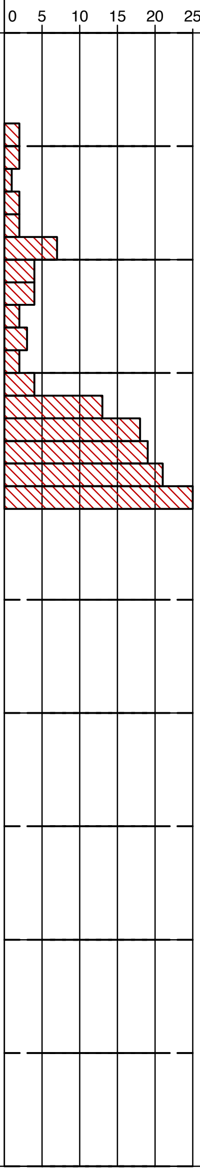
**REPORT NUMBER** 23158

| | | | |
|---|---|---|---|
| **CONTRACT** | Ballymany , Newbridge , Co.Kildare | **PROBE NO.** | **DP107** |
| | | **SHEET** | Sheet 1 of 1 |
| **CO-ORDINATES** | 678,721.23 E<br>714,221.50 N | **DATE DRILLED** | 15/03/2021 |
| **GROUND LEVEL (mOD)** | 98.48 | **DATE LOGGED** | 15/03/2021 |
| **CLIENT** | Anthony Neville Homes Ltd | **PROBE TYPE** | DPH |
| **ENGINEER** | AGL Consulting | | |
| **HAMMER MASS (kg)** | 50 | | |
| **INCREMENT SIZE (mm)** | 100 | | |
| **FALL HEIGHT (mm)** | 500 | | |

| Depth (m) | Geotechnical Description | Legend | Depth (m) | Elevation (mOD) | Water |
|---|---|---|---|---|---|
| 0.0 | . | | | | |
| 2.10 | End of Probe at 2.10 m | | | 96.38 | |

| Depth (m) | Probe Readings (Blows/Increment) |
|---|---|
| 0.00 | 0 |
| 0.10 | 0 |
| 0.20 | 0 |
| 0.30 | 0 |
| 0.40 | 2 |
| 0.50 | 2 |
| 0.60 | 1 |
| 0.70 | 2 |
| 0.80 | 2 |
| 0.90 | 7 |
| 1.00 | 4 |
| 1.10 | 4 |
| 1.20 | 2 |
| 1.30 | 3 |
| 1.40 | 2 |
| 1.50 | 4 |
| 1.60 | 13 |
| 1.70 | 18 |
| 1.80 | 19 |
| 1.90 | 21 |
| 2.00 | 25 |

Graphic Probe Record



**GROUNDWATER OBSERVATIONS**

**REMARKS**

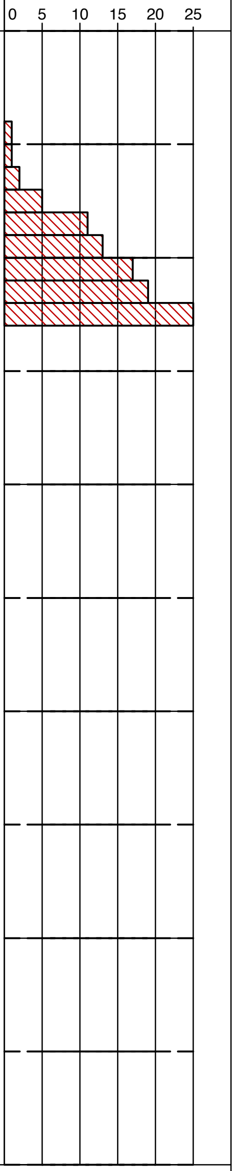
# DYNAMIC PROBE RECORD

| | |
|---|---|
| **REPORT NUMBER** | 23158 |
| **CONTRACT** | Ballymany , Newbridge , Co.Kildare |
| **PROBE NO.** | DP108 |
| **SHEET** | Sheet 1 of 1 |
| **CO-ORDINATES** | |
| **GROUND LEVEL (mOD)** | |
| **DATE DRILLED** | 15/03/2021 |
| **DATE LOGGED** | 15/03/2021 |
| **HAMMER MASS (kg)** | 50 |
| **INCREMENT SIZE (mm)** | 100 |
| **FALL HEIGHT (mm)** | 500 |
| **CLIENT** | Anthony Neville Homes Ltd |
| **ENGINEER** | AGL Consulting |
| **PROBE TYPE** | DPH |

| Depth (m) | Geotechnical Description | Legend | Depth (m) | Elevation (mOD) | Water |
|---|---|---|---|---|---|
| 0.0 | . | | | | |
| 1.0 | | | | | |
| | End of Probe at 1.30 m | | | | |
| 2.0 | | | | | |
| 3.0 | | | | | |
| 4.0 | | | | | |

| Depth (m) | Probe Readings (Blows/Increment) |
|---|---|
| 0.00 | 0 |
| 0.10 | 0 |
| 0.20 | 0 |
| 0.30 | 0 |
| 0.40 | 1 |
| 0.50 | 1 |
| 0.60 | 2 |
| 0.70 | 5 |
| 0.80 | 11 |
| 0.90 | 13 |
| 1.00 | 17 |
| 1.10 | 19 |
| 1.20 | 25 |

Graphic Probe Record



**GROUNDWATER OBSERVATIONS**

**REMARKS**

# Appendix 3

# Geotechnical Laboratory Test Records

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

# Test Report

## Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No. **R120305** Contract No. 23158 Contract Name: Curragh Farm , Ballymanny , Newbridge ,Co.Kildare

Customer Neville Homes Ltd

Samples Received: 18/03/21 Date Tested: 29/03/21

| BH/TP | Sample No. | Depth (m) | Lab. Ref | Sample Type | Moisture Content % | Liquid Limit % | Plastic Limit % | Plasticity Index | % <425µm | Preparation | Liquid Limit Clause | Classification (BS5930) | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP01 | AA157311-14 | 0.9 | A21/1277 | B | 11 | 23 | NP | NP | 94 | WS | 4.4 | | Brown sandy, slightly gravelly, SILT |
| SP02 | AA157307-10 | 1.0 | A21/1278 | B | 9.2 | 25 | NP | NP | 56 | WS | 4.4 | | Brown slightly sandy, gravelly, SILT |
| TP101 | AA140476 | 0.5 | A21/1279 | B | 21 | 25 | NP | NP | 99 | WS | 4.4 | | Brown sandy, SILT |
| TP101 | AA140477 | 1.5 | A21/1280 | B | 21 | | | | | | | | Brown sandy, slightly gravelly, SILT/CLAY |
| TP101 | AA140478 | 1.6 | A21/1281 | B | 22 | | | | | | | | Brown sandy gravelly SILT/CLAY |
| TP102 | AA140482 | 0.5 | A21/1282 | B | 10 | 25 | NP | NP | 32 | WS | 4.4 | | Brown clayey/silty, very gravelly, SAND |
| TP102 | AA104483 | 1.5 | A21/1283 | B | 16 | | | | | | | | Brown sandy gravelly SILT/CLAY |
| TP102 | AA140484 | 2.5 | A21/1284 | B | 5.4 | | | | | | | | Brown slightly sandy, gravelly, SILT/CLAY |
| TP102 | AA140485 | 3.5 | A21/1285 | B | 11 | | | | | | | | Brown sandy gravelly SILT/CLAY |
| TP103 | AA140490 | 0.9 | A21/1286 | B | 28 | 47 | NP | NP | 67 | WS | 4.4 | | Brown sandy, slightly gravelly, SILT |
| TP103 | AA140491 | 1.9 | A21/1287 | B | 18 | | | | | | | | Brown sandy gravelly SILT/CLAY |
| TP103 | AA140492 | 2.0 | A21/1288 | B | 9.9 | 26 | NP | NP | 71 | WS | 4.4 | | Brown sandy, slightly gravelly, SILT |
| TP104 | AA140496 | 0.5 | A21/1289 | B | 16 | 31 | 17 | 14 | 67 | WS | 4.4 | C L | Brown slightly sandy, slightly gravelly, CLAY |
| TP104 | AA140497 | 1.5 | A21/1290 | B | 14 | | | | | | | | Brown sandy, slightly gravelly, SILT/CLAY |
| TP104 | AA140498 | 2.5 | A21/1291 | B | 7.4 | | | | | | | | Brown very gravelly sandy SILT/CLAY |

Notes: Preparation: WS - Wet sieved
AR - As received
NP - Non plastic
Liquid Limit Clause: 4.3 Cone Penetrometer definitive method
4.4 Cone Penetrometer one point method

Sample Type: B - Bulk Disturbed
U - Undisturbed

Remarks:
Results apply to the sample as received.
NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
Opinions and interpretations are outside the scope of accreditation.
The results relate to the specimens tested. Any remaining material will be retained for one month.

| IGSL Ltd Materials Laboratory | Persons authorized to approve reports | Approved by | Date | Page |
|---|---|---|---|---|
| | H Byrne (Laboratory Manager) | H Byrne | 26/04/21 | 1 of 1 |

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

# Test Report

## Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3

Report No. **R120306** Contract No. 23158 Contract Name: Curragh Farm , Ballymanny , Newbridge ,Co.Kildare

Customer Neville Homes Ltd

Samples Received: 18/03/21 Date Tested: 29/03/21

| BH/TP | Sample No. | Depth (m) | Lab. Ref | Sample Type | Moisture Content % | Liquid Limit % | Plastic Limit % | Plasticity Index | % <425μm | Preparation | Liquid Limit Clause | Classification (BS5930) | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TP104 | AA140499 | 4.2 | A21/1292 | B | 9.3 | | | | | | | | Brown sandy gravelly SILT/CLAY |
| TP105 | AA157301 | 0.5 | A21/1293 | B | 19 | 37 | 18 | 19 | 71 | WS | 4.4 | | Brown slightly sandy, slightly gravelly, CLAY |
| TP105 | AA157302 | 1.5 | A21/1294 | B | 11 | | | | | | | | Brown sandy gravelly CLAY |
| TP105 | AA157303 | 2.5 | A21/1295 | B | 5.2 | | | | | | | | Brown sandy gravelly CLAY |
| TP106 | AA145493 | 0.5 | A21/1296 | B | 18 | 32 | 17 | 15 | 80 | WS | 4.4 | | Brown sandy, slightly gravelly, CLAY |
| TP106 | AA145494 | 1.6 | A21/1297 | B | 15 | 28 | 15 | 13 | 86 | WS | 4.4 | | Brown sandy gravelly CLAY |
| TP106 | AA145495 | 3.5 | A21/1298 | B | 8.2 | | | | | | | | Brown sandy gravelly CLAY |
| TP107 | AA145479 | 0.5 | A21/1282 | B | 22 | 22 | NP | NP | 97 | WS | 4.4 | | Brown slightly sandy, slightly gravelly, SILT |
| TP107 | AA145480 | 1.2 | A21/1300 | B | 21 | | | | | | | | Brown sandy, slightly gravelly, SILT/CLAY |
| TP107 | AA145481 | 1.2 | A21/1301 | B | 21 | | | | | | | | Brown sandy gravelly SILT/CLAY |
| TP107 | AA145482 | 1.7 | A21/1302 | B | 7.6 | | | | | | | | Brown silty/clayey gravelly SAND |
| TP107 | AA145483 | 4.2 | A21/1303 | B | 11 | | | | | | | | Brown silty/clayey gravelly silty SAND |
| TP108 | AA145487 | 0.5 | A21/1304 | B | 22 | 32 | 17 | 15 | 73 | WS | 4.4 | | Brown slightly sandy, slightly gravelly, CLAY |
| TP108 | AA145488 | 1.3 | A21/1305 | B | 20 | | | | | | | | Brown slightly sandy, slightly gravelly, SILT/CLAY |
| TP108 | AA145489 | 3.0 | A21/1306 | B | 22 | | | | | | | | Brown sandy gravelly SILT/CLAY |

Notes:

Preparation: WS - Wet sieved
AR - As received
NP - Non plastic

Liquid Limit Clause: 4.3 Cone Penetrometer definitive method
4.4 Cone Penetrometer one point method

Sample Type: B - Bulk Disturbed
U - Undisturbed

Remarks:
Results apply to the sample as received.
NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
Opinions and interpretations are outside the scope of accreditation.
The results relate to the specimens tested. Any remaining material will be retained for one month.

| IGSL Ltd Materials Laboratory | Persons authorized to approve reports | Approved by | Date | Page |
|---|---|---|---|---|
| | H Byrne (Laboratory Manager) | H Byrne | 26/04/21 | 1 of 1 |

# TEST REPORT
## Determination of Particle Size Distribution

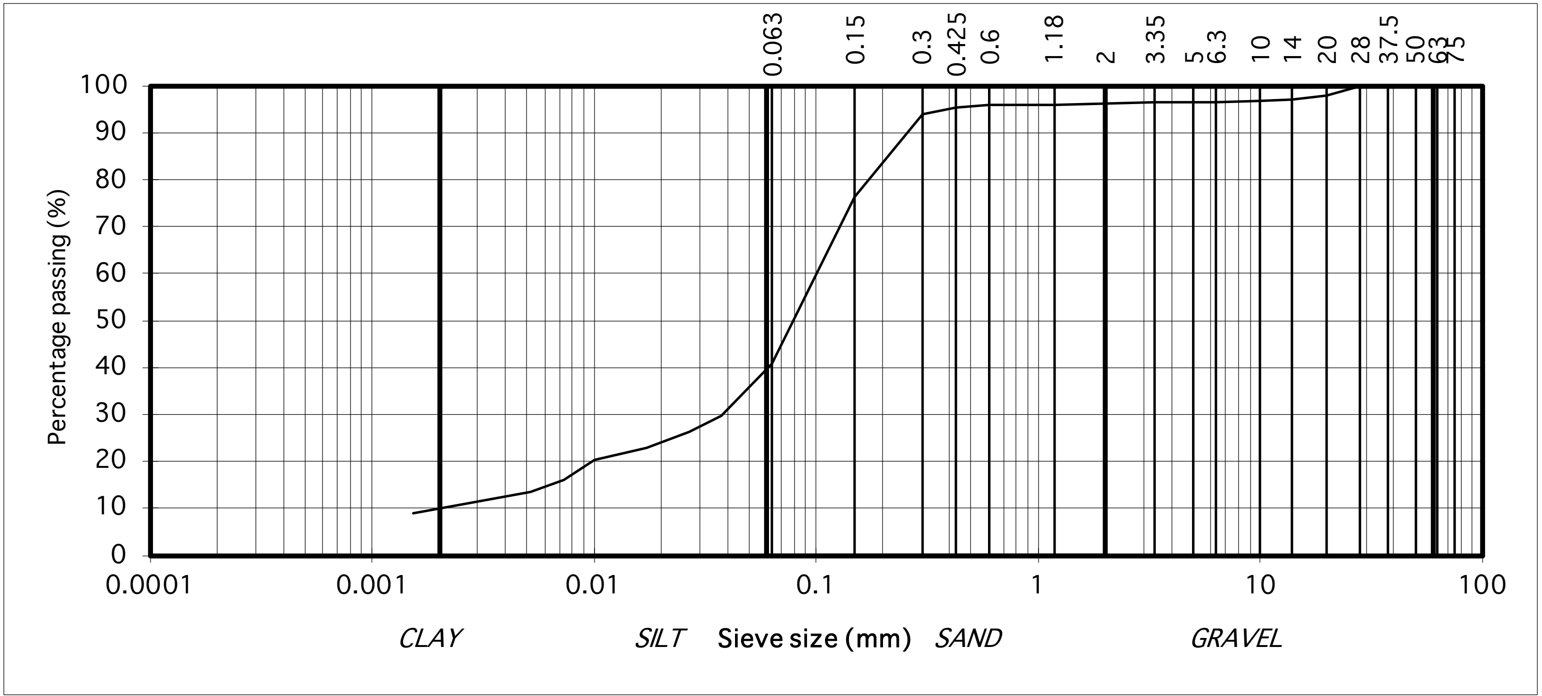
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO.133T

Contract No. 23158 Report No. R120746
Contract Name: Curragh Farm , Ballymanny , Newbridge , Co.Kildare
BH/TP : SP01
Sample No. AA157311-14 Lab. Sample No. A21/1277
Sample Type: B
Depth (m) 0.90 Customer: Neville Homes ltd
Date Received 18/03/2021 Date Testing started 29/03/2021
Description: Brown sandy, slightly gravelly, SILT

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received.

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 100 | |
| 28 | 100 | |
| 20 | 98 | |
| 14 | 97 | |
| 10 | 97 | |
| 6.3 | 97 | |
| 5 | 97 | |
| 3.35 | 97 | |
| 2 | 96 | |
| 1.18 | 96 | SAND |
| 0.6 | 96 | |
| 0.425 | 95 | |
| 0.3 | 94 | |
| 0.15 | 76 | |
| 0.063 | 41 | SILT/CLAY |
| 0.037 | 30 | |
| 0.027 | 26 | |
| 0.017 | 23 | |
| 0.010 | 20 | |
| 0.007 | 16 | |
| 0.005 | 14 | |
| 0.002 | 9 | |



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

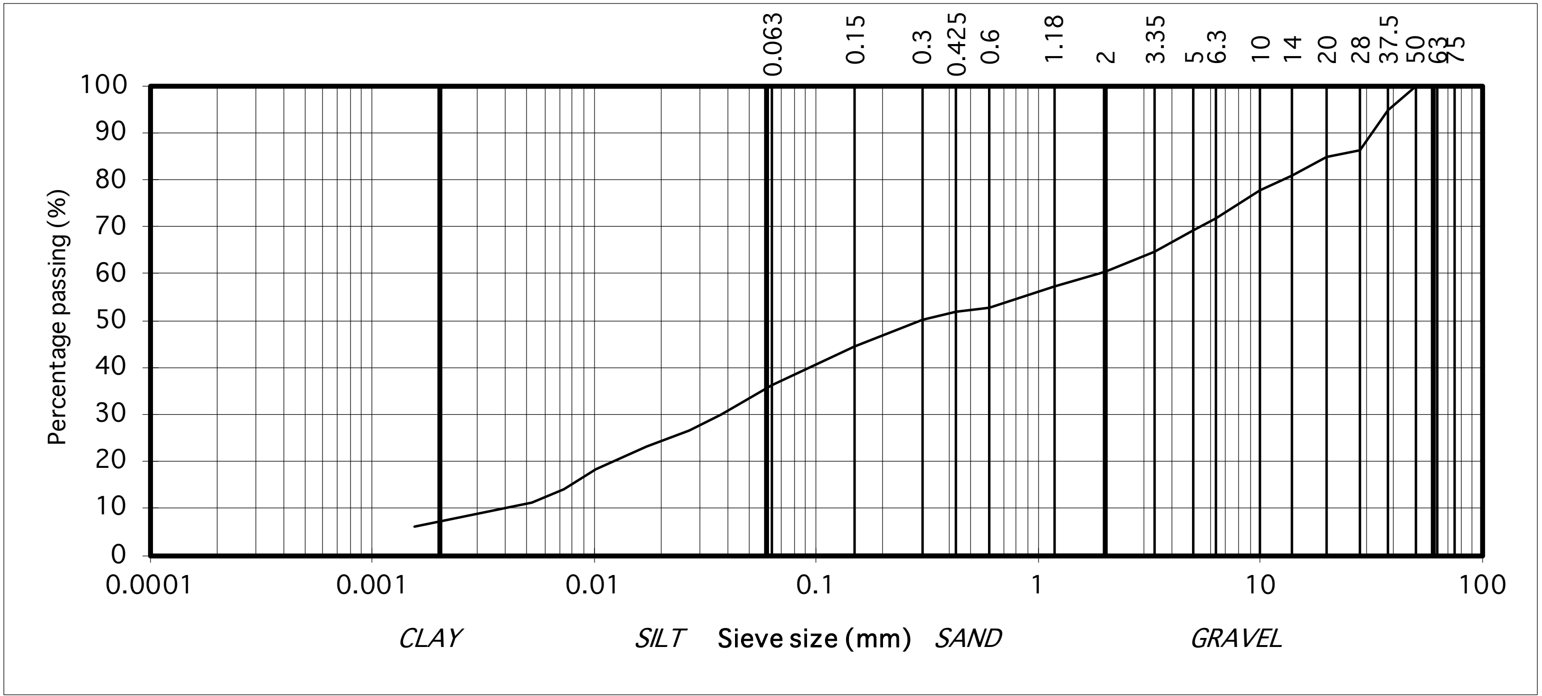
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

# TEST REPORT
## Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025
INAB
ACCREDITED
TESTING
DETAILED IN SCOPE REG NO.133T

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 95 | |
| 28 | 86 | |
| 20 | 85 | |
| 14 | 81 | |
| 10 | 78 | |
| 6.3 | 72 | |
| 5 | 69 | |
| 3.35 | 65 | |
| 2 | 60 | |
| 1.18 | 57 | SAND |
| 0.6 | 53 | |
| 0.425 | 52 | |
| 0.3 | 50 | |
| 0.15 | 45 | |
| 0.063 | 36 | SILT/CLAY |
| 0.037 | 30 | |
| 0.027 | 26 | |
| 0.017 | 23 | |
| 0.010 | 18 | |
| 0.007 | 14 | |
| 0.005 | 11 | |
| 0.002 | 6 | |

| | | | |
|---|---|---|---|
| Contract No. | 23158 | Report No. | R120588 |
| Contract Name: | Curragh Farm , Ballymanny , Newbridge , Co.Kildare | | |
| BH/TP : | SP02 | | |
| Sample No. | AA157307-10 | Lab. Sample No. | A21/1278 |
| Sample Type: | B | | |
| Depth (m) | 1.00 | Customer: | Neville Homes ltd |
| Date Received | 18/03/2021 | Date Testing started | 29/03/2021 |
| Description: | Brown slightly sandy, gravelly, SILT | | |
| Remarks | Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received. | | |



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| | 19/04/21 | 1 of 1 |

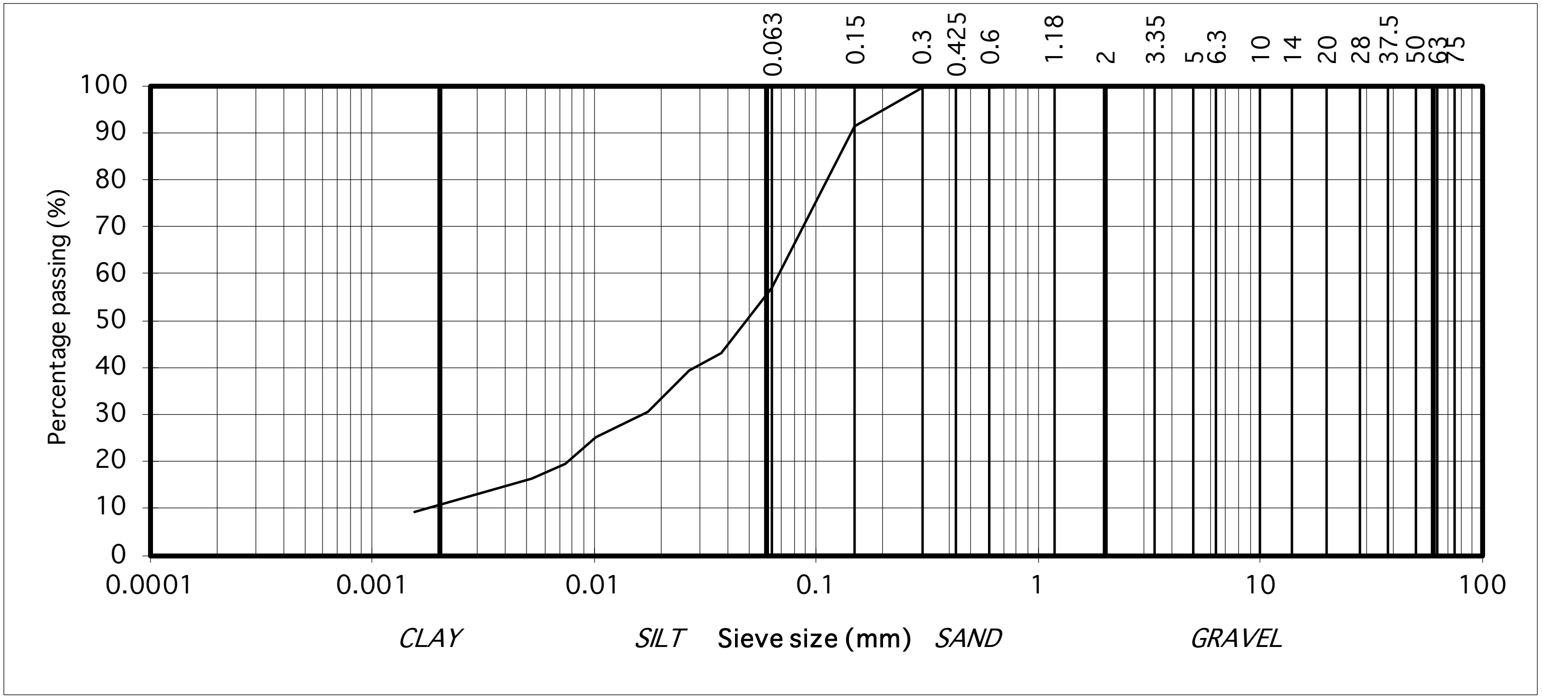
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

# TEST REPORT
## Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

Contract No. 23158 Report No. R120747
Contract Name: Curragh Farm , Ballymanny , Newbridge , Co.Kildare
BH/TP : TP101
Sample No. AA140476 Lab. Sample No. A21/1279
Sample Type: B
Depth (m) 0.50 Customer: Neville Homes ltd
Date Received 18/03/2021 Date Testing started 29/03/2021
Description: Brown sandy, SILT

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received.

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 100 | |
| 28 | 100 | |
| 20 | 100 | |
| 14 | 100 | |
| 10 | 100 | |
| 6.3 | 100 | |
| 5 | 100 | |
| 3.35 | 100 | |
| 2 | 100 | |
| 1.18 | 100 | SAND |
| 0.6 | 100 | |
| 0.425 | 100 | |
| 0.3 | 100 | |
| 0.15 | 92 | |
| 0.063 | 57 | SILT/CLAY |
| 0.038 | 43 | |
| 0.027 | 39 | |
| 0.018 | 31 | |
| 0.010 | 25 | |
| 0.007 | 19 | |
| 0.005 | 16 | |
| 0.002 | 9 | |



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

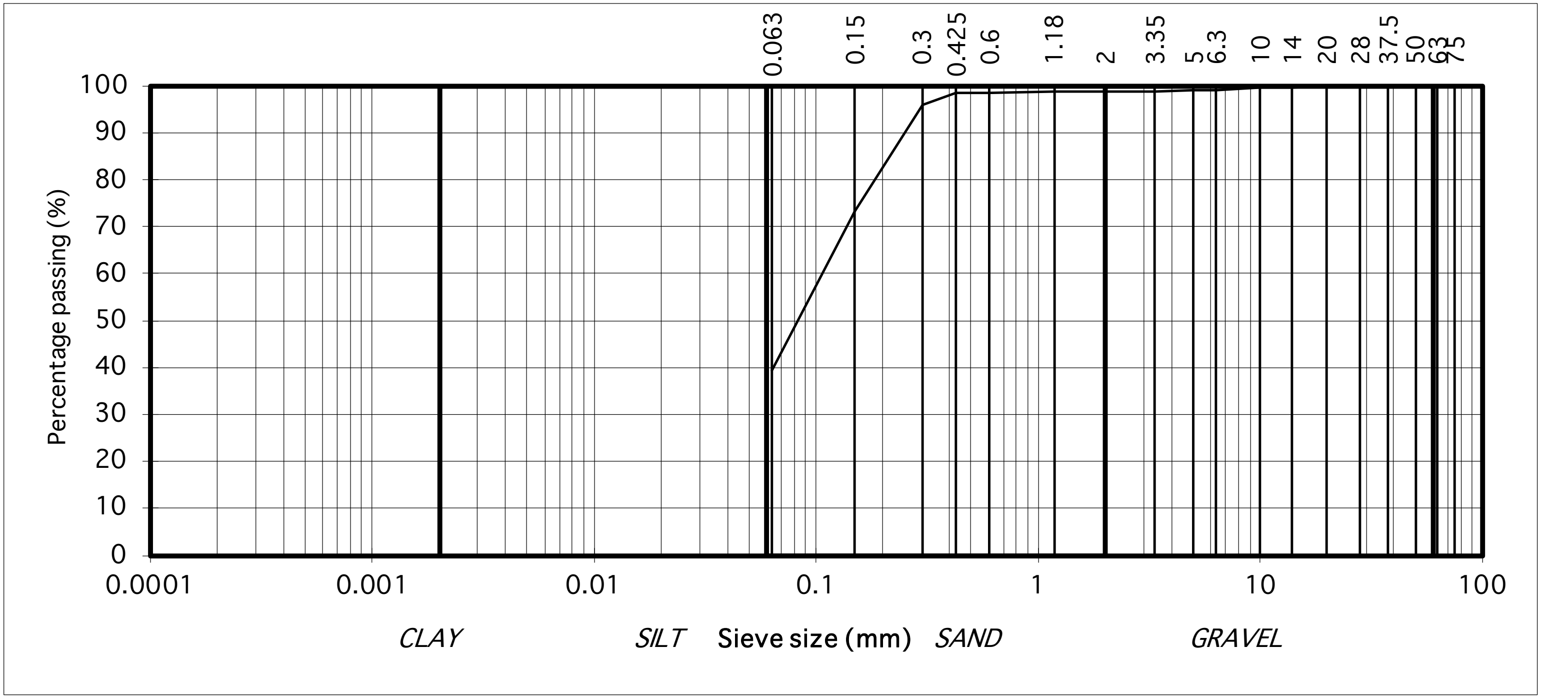
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

# TEST REPORT
# Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025
INAB
ACCREDITED
TESTING
DETAILED IN SCOPE REG NO.133T

| | | | |
|---|---|---|---|
| Contract No. | 23158 | Report No. | R120589 |
| Contract Name: | Curragh Farm , Ballymanny , Newbridge , Co.Kildare | | |
| BH/TP : | TP101 | | |
| Sample No. | AA140477 | Lab. Sample No. | A21/1280 |
| Sample Type: | B | | |
| Depth (m) | 1.50 | Customer: | Neville Homes ltd |
| Date Received | 18/03/2021 | Date Testing started | 29/03/2021 |
| Description: | Brown sandy, slightly gravelly, SILT/CLAY | | |
| Remarks | Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received. | | |

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 100 | |
| 28 | 100 | |
| 20 | 100 | |
| 14 | 100 | |
| 10 | 100 | |
| 6.3 | 99 | |
| 5 | 99 | |
| 3.35 | 99 | |
| 2 | 99 | |
| 1.18 | 99 | SAND |
| 0.6 | 99 | |
| 0.425 | 99 | |
| 0.3 | 96 | |
| 0.15 | 73 | |
| 0.063 | 39 | SILT/CLAY |



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| H Byrne | 19/04/21 | 1 of 1 |

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

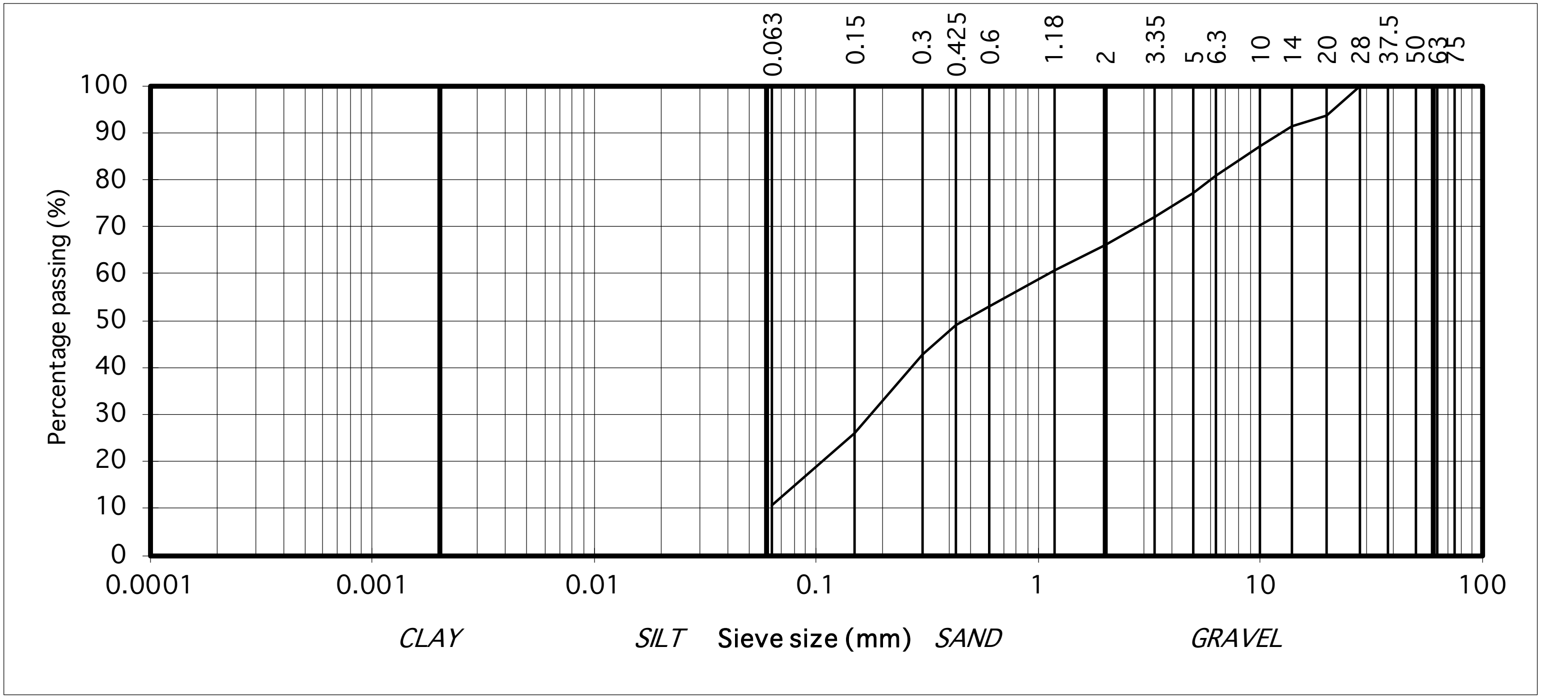
# TEST REPORT
## Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO.133T

Contract No. 23158 Report No. R120590
Contract Name: Curragh Farm , Ballymanny , Newbridge , Co.Kildare
BH/TP : TP102
Sample No. AA140482 Lab. Sample No. A21/1282
Sample Type: B
Depth (m) 0.50 Customer: Neville Homes ltd
Date Received 18/03/2021 Date Testing started 29/03/2021
Description: Brown clayey/silty, very gravelly, SAND

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received.

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 100 | |
| 28 | 100 | |
| 20 | 94 | |
| 14 | 91 | |
| 10 | 87 | |
| 6.3 | 81 | |
| 5 | 77 | |
| 3.35 | 72 | |
| 2 | 66 | |
| 1.18 | 61 | SAND |
| 0.6 | 53 | |
| 0.425 | 49 | |
| 0.3 | 43 | |
| 0.15 | 26 | |
| 0.063 | 11 | SILT/CLAY |



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| H Byrne | 19/04/21 | 1 of 1 |

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

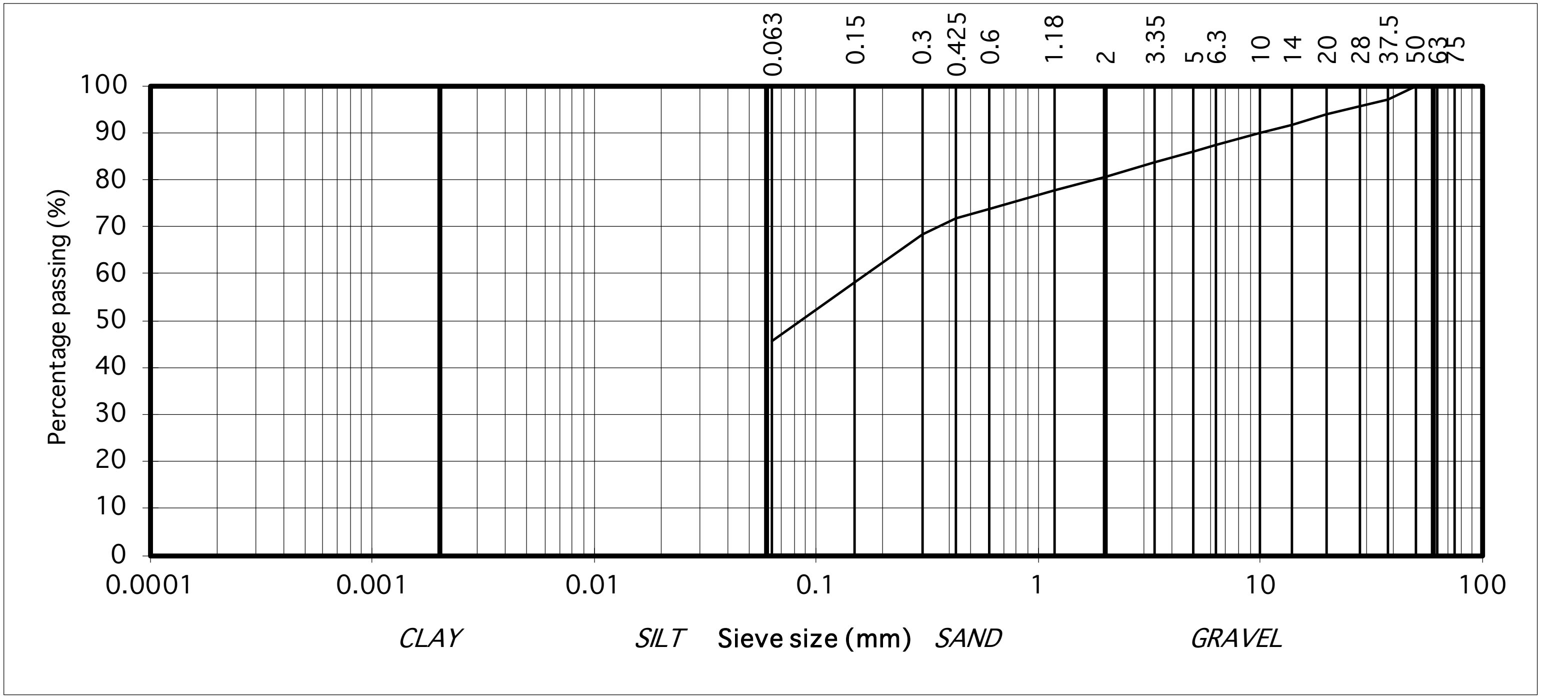
# TEST REPORT
## Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO.133T

Contract No. 23158 Report No. R120748
Contract Name: Curragh Farm , Ballymanny , Newbridge , Co.Kildare
BH/TP : TP102
Sample No. AA140483 Lab. Sample No. A21/1283
Sample Type: B
Depth (m) 1.50 Customer: Neville Homes ltd
Date Received 18/03/2021 Date Testing started 29/03/2021
Description: Brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received.

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 97 | |
| 28 | 96 | |
| 20 | 94 | |
| 14 | 92 | |
| 10 | 90 | |
| 6.3 | 88 | |
| 5 | 86 | |
| 3.35 | 84 | |
| 2 | 81 | |
| 1.18 | 78 | SAND |
| 0.6 | 74 | |
| 0.425 | 72 | |
| 0.3 | 68 | |
| 0.15 | 58 | |
| 0.063 | 46 | SILT/CLAY |



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

# TEST REPORT
# Determination of Particle Size Distribution

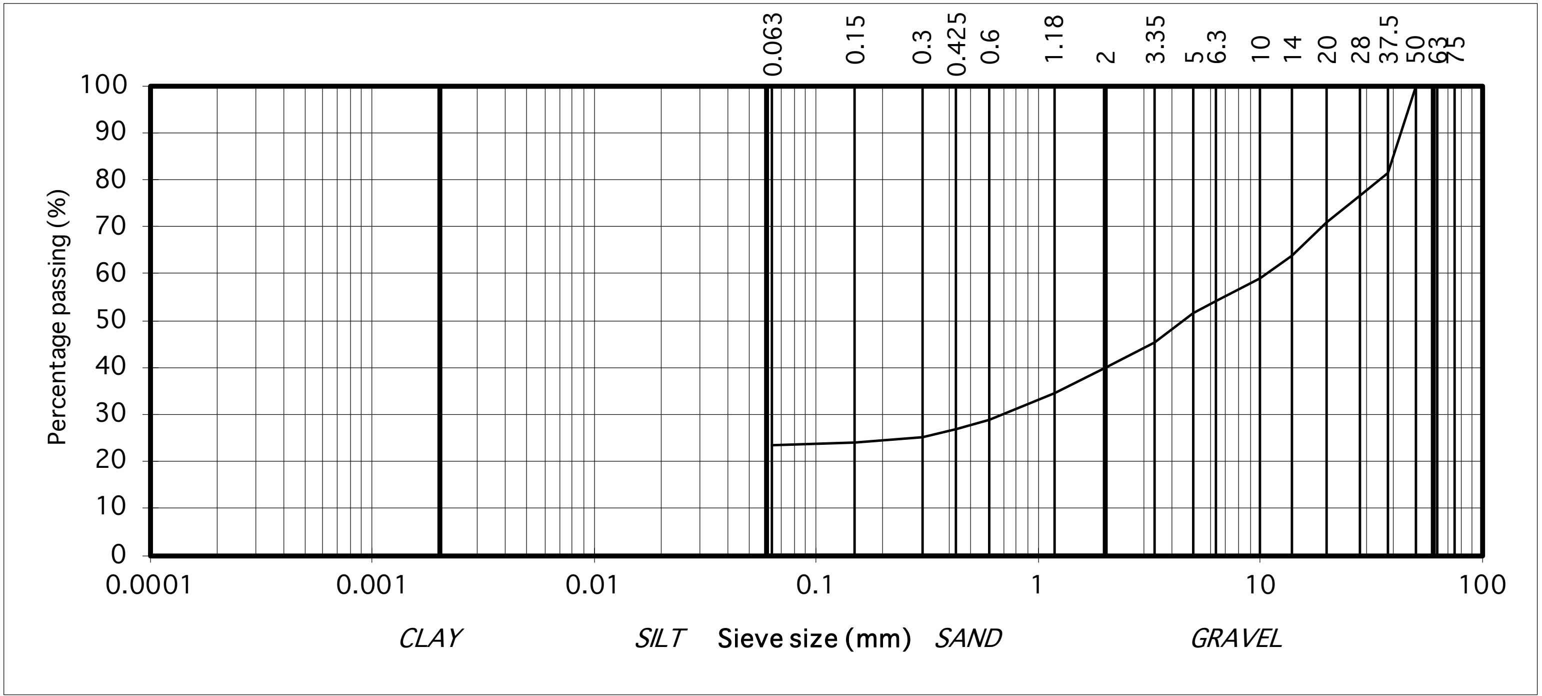
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

| | | | |
|---|---|---|---|
| Contract No. | 23158 | Report No. | R120591 |
| Contract Name: | Curragh Farm , Ballymanny , Newbridge , Co.Kildare | | |
| BH/TP : | TP102 | | |
| Sample No. | AA140484 | Lab. Sample No. | A21/1284 |
| Sample Type: | B | | |
| Depth (m) | 2.50 | Customer: | Neville Homes ltd |
| Date Received | 18/03/2021 | Date Testing started | 29/03/2021 |
| Description: | Brown slightly sandy, gravelly, SILT/CLAY | | |

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received. Sample size did not meet the requirements of BS1377

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 82 | |
| 28 | 77 | |
| 20 | 71 | |
| 14 | 64 | |
| 10 | 59 | |
| 6.3 | 54 | |
| 5 | 52 | |
| 3.35 | 45 | |
| 2 | 40 | |
| 1.18 | 34 | SAND |
| 0.6 | 29 | |
| 0.425 | 27 | |
| 0.3 | 25 | |
| 0.15 | 24 | |
| 0.063 | 24 | SILT/CLAY |



| | | | |
|---|---|---|---|
| IGSL Ltd Materials Laboratory | Approved by: | Date: | Page no: |
| | H Byrne | 26/04/21 | 1 of 1 |

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

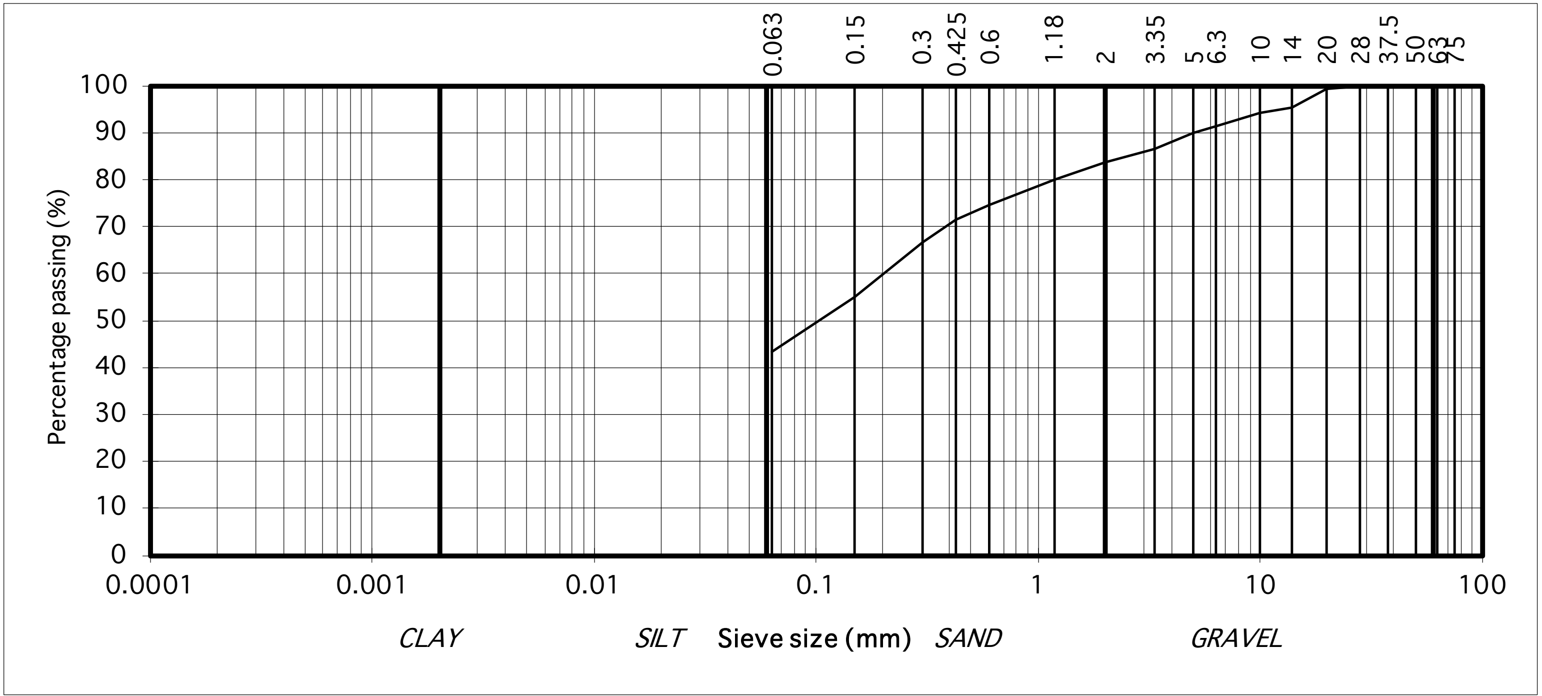
# TEST REPORT
## Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Contract No. 23158 Report No. R12079
Contract Name: Curragh Farm , Ballymanny , Newbridge , Co.Kildare
BH/TP : TP103
Sample No. AA140490 Lab. Sample No. A21/1286
Sample Type: B
Depth (m) 0.90 Customer: Neville Homes ltd
Date Received 18/03/2021 Date Testing started 29/03/2021
Description: Brown sandy, slightly gravelly, SILT

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received.

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 100 | |
| 28 | 100 | |
| 20 | 100 | |
| 14 | 96 | |
| 10 | 94 | |
| 6.3 | 92 | |
| 5 | 90 | |
| 3.35 | 87 | |
| 2 | 84 | |
| 1.18 | 80 | SAND |
| 0.6 | 75 | |
| 0.425 | 71 | |
| 0.3 | 67 | |
| 0.15 | 55 | |
| 0.063 | 44 | SILT/CLAY |



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

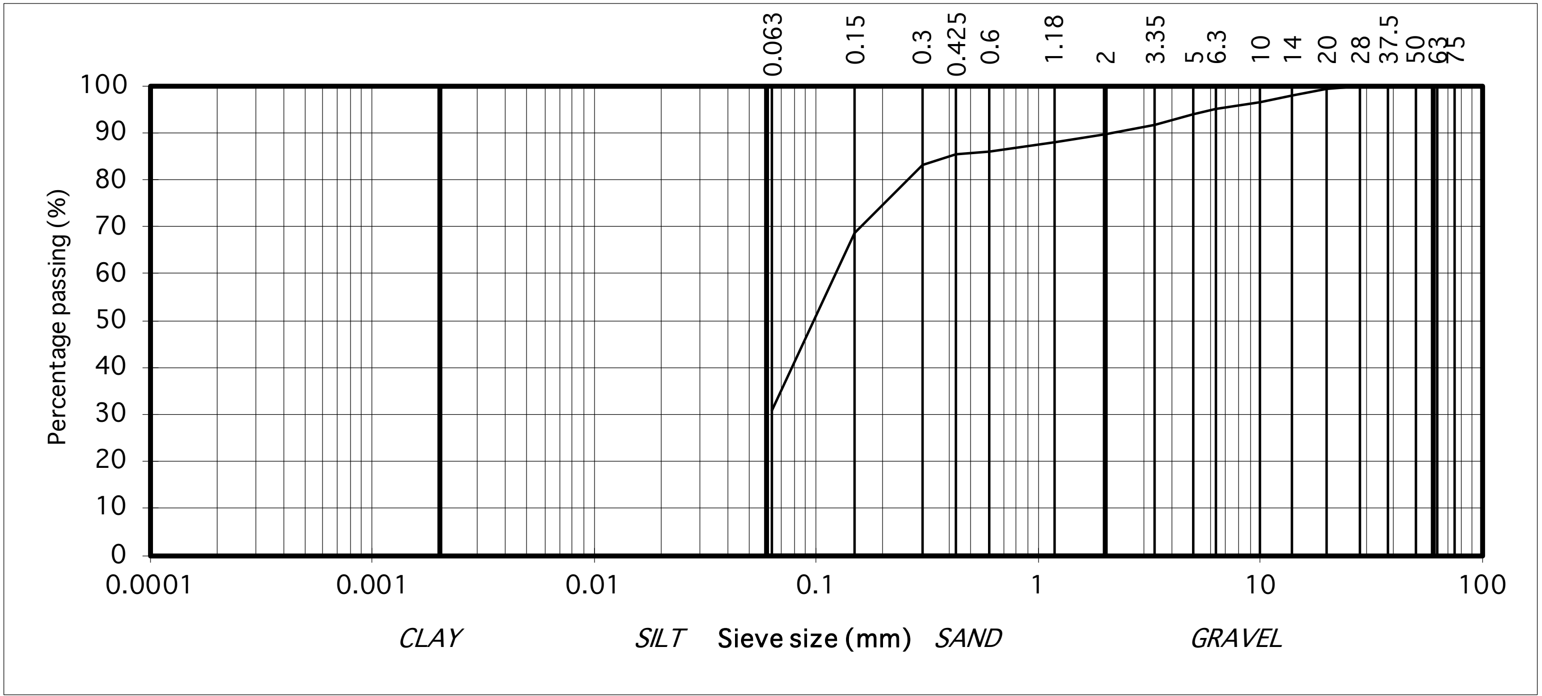
# TEST REPORT
## Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO.133T

| particle size | % passing |
|---|---|
| 75 | 100 |
| 63 | 100 |
| 50 | 100 |
| 37.5 | 100 |
| 28 | 100 |
| 20 | 100 |
| 14 | 98 |
| 10 | 97 |
| 6.3 | 95 |
| 5 | 94 |
| 3.35 | 92 |
| 2 | 90 |
| 1.18 | 88 |
| 0.6 | 86 |
| 0.425 | 85 |
| 0.3 | 83 |
| 0.15 | 69 |
| 0.063 | 31 |

COBBLES
GRAVEL
SAND
SILT/CLAY

| | | | |
|---|---|---|---|
| Contract No. | 23158 | Report No. | R120592 |
| Contract Name: | Curragh Farm , Ballymanny , Newbridge , Co.Kildare | | |
| BH/TP : | TP103 | | |
| Sample No. | AA140492 | Lab. Sample No. | A21/1288 |
| Sample Type: | B | | |
| Depth (m) | 2.00 | Customer: | Neville Homes ltd |
| Date Received | 18/03/2021 | Date Testing started | 29/03/2021 |
| Description: | Brown sandy, slightly gravelly, SILT | | |
| Remarks | Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received. | | |



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

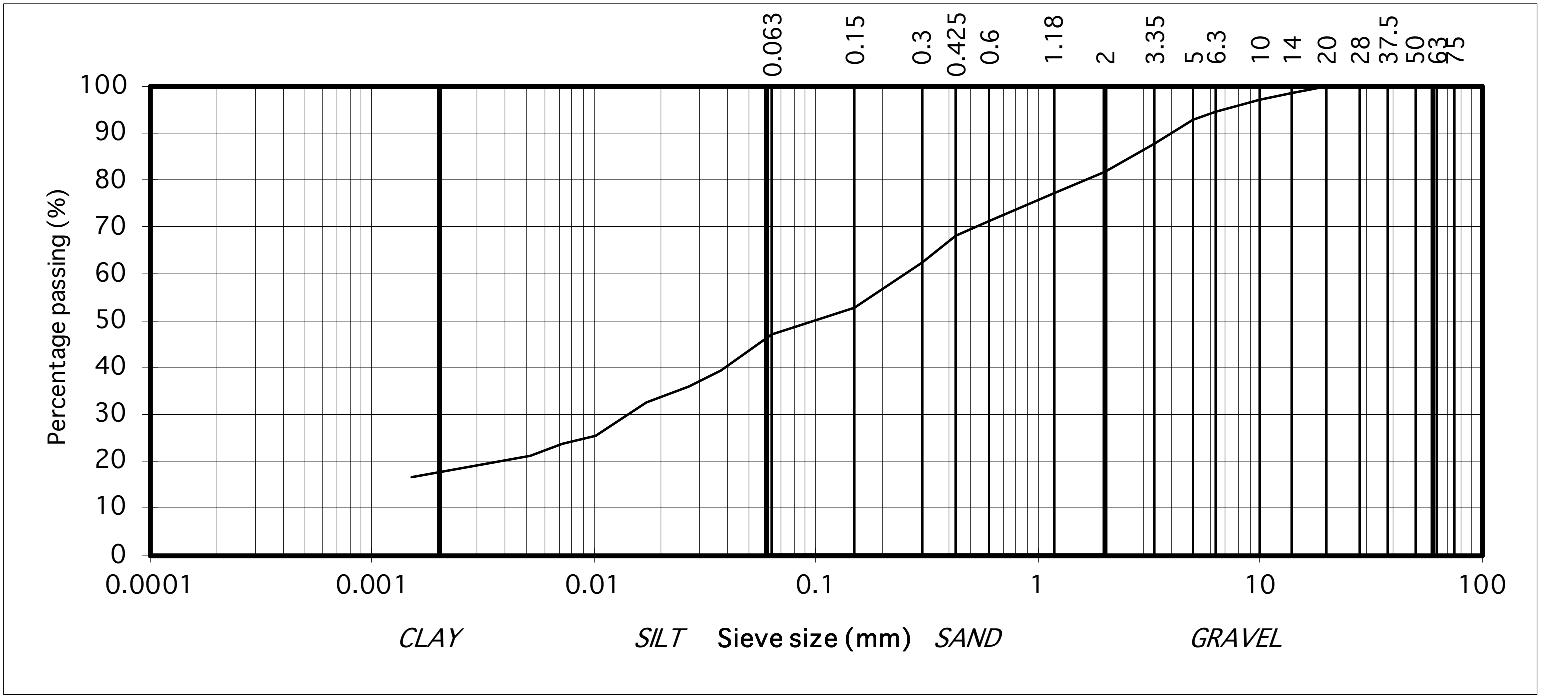
# TEST REPORT
## Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025
INAB
ACCREDITED
TESTING
DETAILED IN SCOPE REG NO.133T

Contract No. 23158 Report No. R120593
Contract Name: Curragh Farm , Ballymanny , Newbridge , Co.Kildare
BH/TP : TP104
Sample No. AA140496 Lab. Sample No. A21/1289
Sample Type: B
Depth (m) 0.50 Customer: Neville Homes ltd
Date Received 18/03/2021 Date Testing started 29/03/2021
Description: Brown slightly sandy, slightly gravelly, CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received.

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 100 | |
| 28 | 100 | |
| 20 | 100 | |
| 14 | 99 | |
| 10 | 97 | |
| 6.3 | 95 | |
| 5 | 93 | |
| 3.35 | 88 | |
| 2 | 82 | |
| 1.18 | 77 | SAND |
| 0.6 | 71 | |
| 0.425 | 68 | |
| 0.3 | 63 | |
| 0.15 | 53 | |
| 0.063 | 47 | SILT/CLAY |
| 0.038 | 39 | |
| 0.027 | 36 | |
| 0.017 | 32 | |
| 0.010 | 25 | |
| 0.007 | 24 | |
| 0.005 | 21 | |
| 0.002 | 17 | |



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| | 19/04/21 | 1 of 1 |

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

# TEST REPORT
## Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

| | | | |
|---|---|---|---|
| Contract No. | 23158 | Report No. | R120594 |
| Contract Name: | Curragh Farm , Ballymanny , Newbridge , Co.Kildare | | |
| BH/TP : | TP104 | | |
| Sample No. | AA140497 | Lab. Sample No. | A21/1290 |
| Sample Type: | B | | |
| Depth (m) | 1.50 | Customer: | Neville Homes ltd |
| Date Received | 18/03/2021 | Date Testing started | 29/03/2021 |
| Description: | Brown sandy, slightly gravelly, SILT/CLAY | | |
| Remarks | Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received. | | |

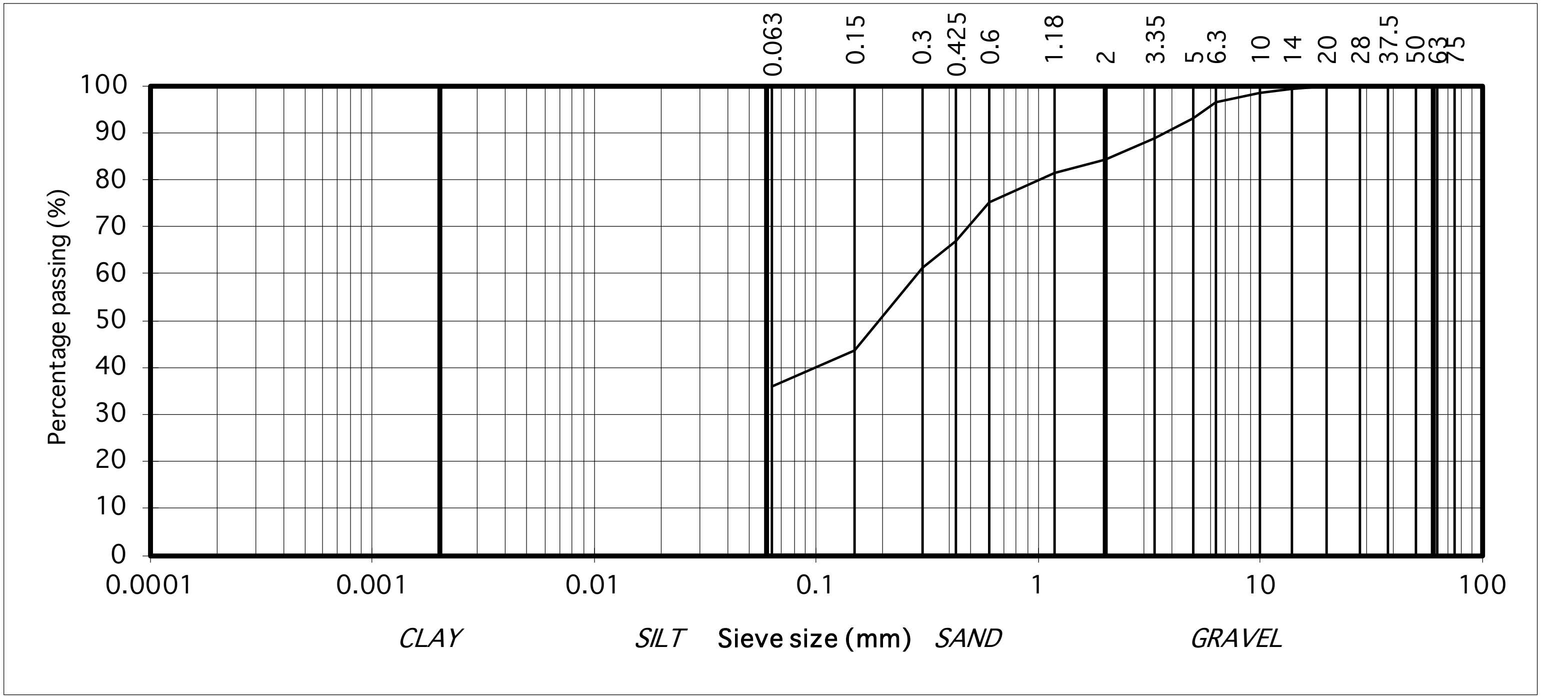
| particle size | % passing |
|---|---|
| 75 | 100 |
| 63 | 100 |
| 50 | 100 |
| 37.5 | 100 |
| 28 | 100 |
| 20 | 100 |
| 14 | 99 |
| 10 | 99 |
| 6.3 | 97 |
| 5 | 93 |
| 3.35 | 89 |
| 2 | 84 |
| 1.18 | 81 |
| 0.6 | 75 |
| 0.425 | 67 |
| 0.3 | 61 |
| 0.15 | 44 |
| 0.063 | 36 |

COBBLES

GRAVEL

SAND

SILT/CLAY



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

# TEST REPORT
## Determination of Particle Size Distribution

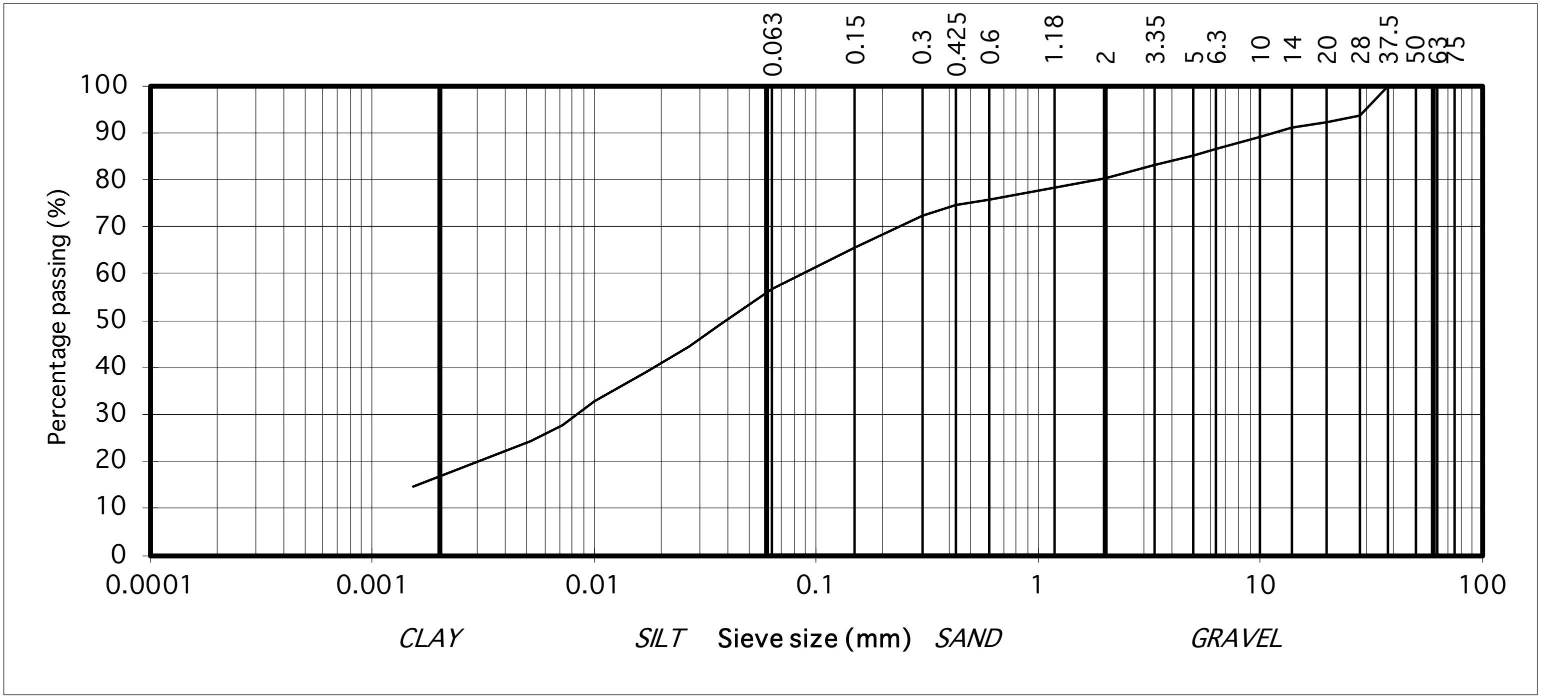
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025
INAB
ACCREDITED
TESTING
DETAILED IN SCOPE REG NO.133T

Contract No. 23158 Report No. R120750
Contract Name: Curragh Farm , Ballymanny , Newbridge , Co.Kildare
BH/TP : TP105
Sample No. AA137301 Lab. Sample No. A21/1293
Sample Type: B
Depth (m) 0.50 Customer: Neville Homes ltd
Date Received 18/03/2021 Date Testing started 29/03/2021
Description: Brown slightly sandy, slightly gravelly, CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received.

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 100 | |
| 28 | 94 | |
| 20 | 92 | |
| 14 | 91 | |
| 10 | 89 | |
| 6.3 | 87 | |
| 5 | 85 | |
| 3.35 | 83 | |
| 2 | 80 | |
| 1.18 | 78 | SAND |
| 0.6 | 76 | |
| 0.425 | 75 | |
| 0.3 | 72 | |
| 0.15 | 66 | |
| 0.063 | 57 | |
| 0.037 | 49 | SILT/CLAY |
| 0.027 | 45 | |
| 0.017 | 39 | |
| 0.010 | 33 | |
| 0.007 | 28 | |
| 0.005 | 24 | |
| 0.002 | 15 | |



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

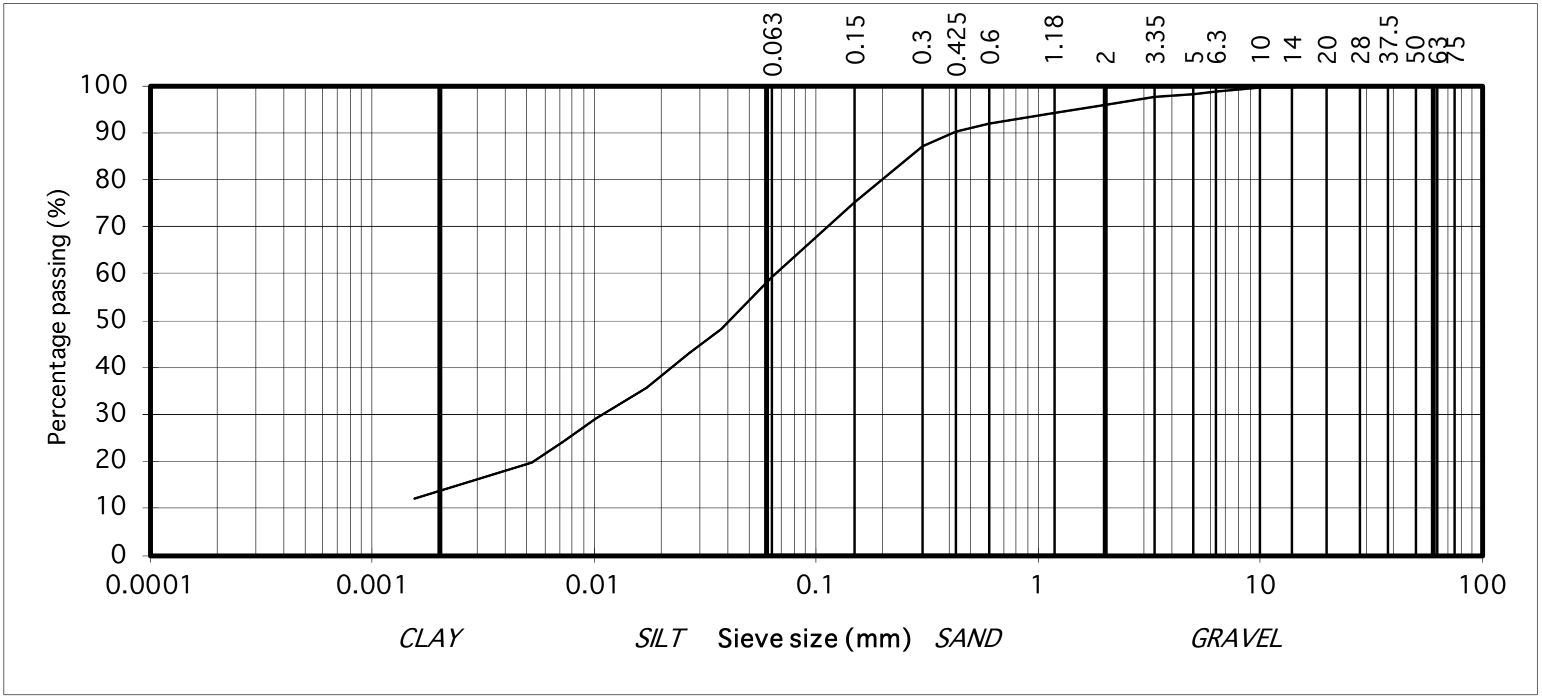
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

# TEST REPORT
## Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 100 | |
| 28 | 100 | |
| 20 | 100 | |
| 14 | 100 | |
| 10 | 100 | |
| 6.3 | 99 | |
| 5 | 98 | |
| 3.35 | 98 | |
| 2 | 96 | |
| 1.18 | 94 | SAND |
| 0.6 | 92 | |
| 0.425 | 90 | |
| 0.3 | 87 | |
| 0.15 | 75 | |
| 0.063 | 59 | SILT/CLAY |
| 0.037 | 48 | |
| 0.027 | 43 | |
| 0.017 | 36 | |
| 0.010 | 29 | |
| 0.007 | 24 | |
| 0.005 | 20 | |
| 0.002 | 12 | |

| | | | |
|---|---|---|---|
| Contract No. | 23158 | Report No. | R120751 |
| Contract Name: | Curragh Farm , Ballymanny , Newbridge , Co.Kildare | | |
| BH/TP : | TP106 | | |
| Sample No. | AA145493 | Lab. Sample No. | A21/1296 |
| Sample Type: | B | | |
| Depth (m) | 0.50 | Customer: | Neville Homes ltd |
| Date Received | 18/03/2021 | Date Testing started | 29/03/2021 |
| Description: | Brown sandy, slightly gravelly, CLAY | | |
| Remarks | Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received. | | |



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

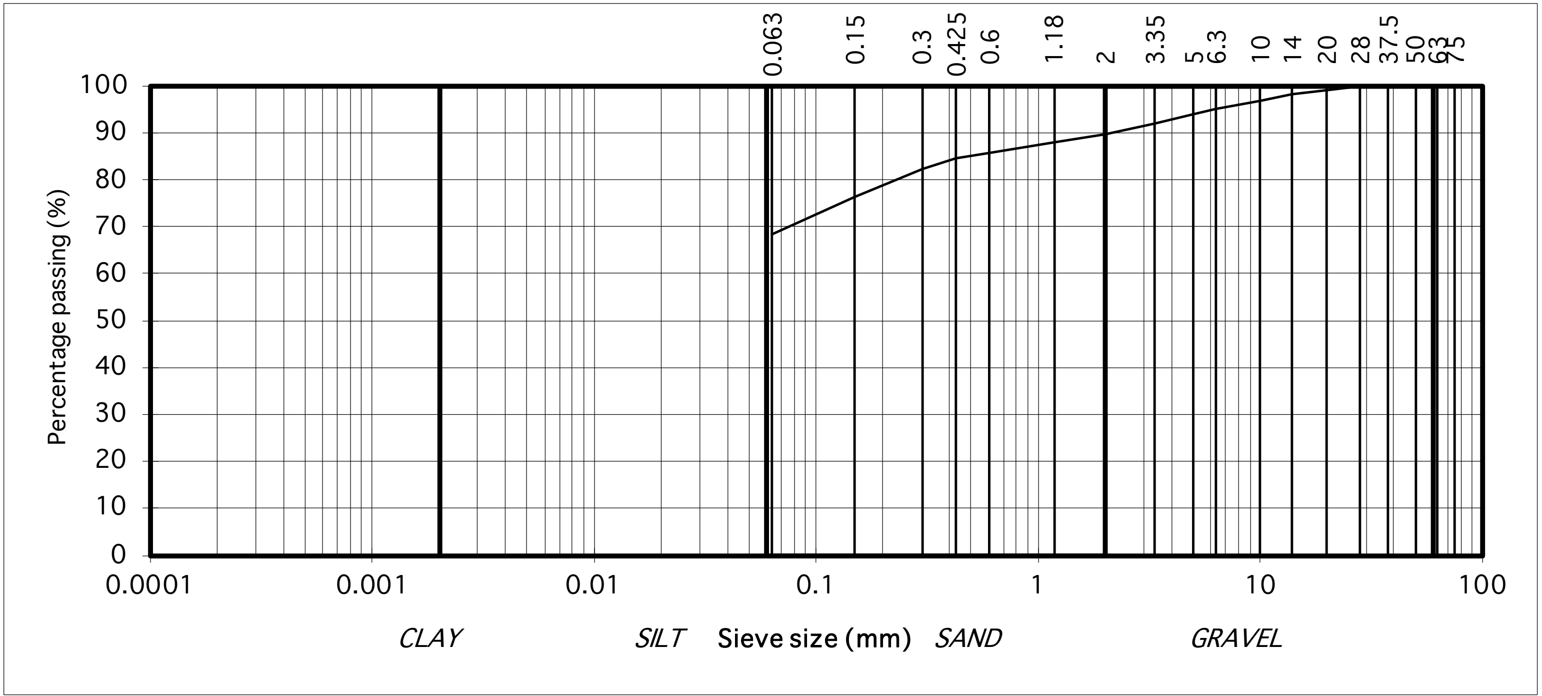
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

# TEST REPORT
## Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025
INAB
ACCREDITED
TESTING
DETAILED IN SCOPE REG NO.133T

| | | | |
|---|---|---|---|
| Contract No. | 23158 | Report No. | R120752 |
| Contract Name: | Curragh Farm , Ballymanny , Newbridge , Co.Kildare | | |
| BH/TP : | TP107 | | |
| Sample No. | AA145479 | Lab. Sample No. | A21/1299 |
| Sample Type: | B | | |
| Depth (m) | 0.50 | Customer: | Neville Homes ltd |
| Date Received | 18/03/2021 | Date Testing started | 29/03/2021 |
| Description: | Brown slightly sandy, slightly gravelly, SILT | | |
| Remarks | Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received. | | |

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 100 | |
| 28 | 100 | |
| 20 | 99 | |
| 14 | 98 | |
| 10 | 97 | |
| 6.3 | 95 | |
| 5 | 94 | |
| 3.35 | 92 | |
| 2 | 90 | |
| 1.18 | 88 | SAND |
| 0.6 | 86 | |
| 0.425 | 85 | |
| 0.3 | 82 | |
| 0.15 | 76 | |
| 0.063 | 68 | SILT/CLAY |



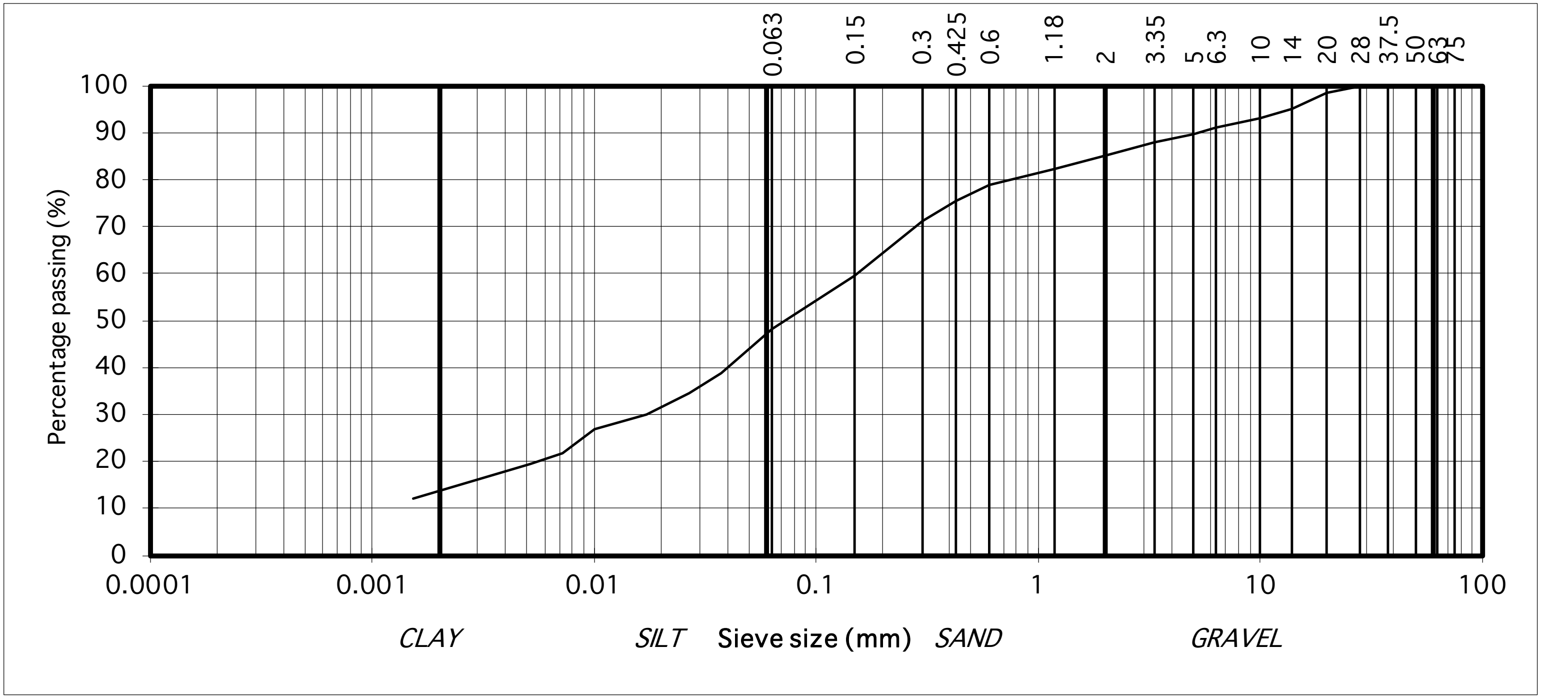
| IGSL Ltd Materials Laboratory | Approved by: | Date: | Page no: |
|---|---|---|---|
| | H Byrne | 26/04/21 | 1 of 1 |

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

# TEST REPORT
## Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

| | | | |
|---|---|---|---|
| Contract No. | 23158 | Report No. | R120753 |
| Contract Name: | Curragh Farm , Ballymanny , Newbridge , Co.Kildare | | |
| BH/TP : | TP107 | | |
| Sample No. | AA145480 | Lab. Sample No. | A21/1300 |
| Sample Type: | B | | |
| Depth (m) | 1.20 | Customer: | Neville Homes ltd |
| Date Received | 18/03/2021 | Date Testing started | 29/03/2021 |
| Description: | Brown sandy, slightly gravelly, SILT/CLAY | | |
| Remarks | Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received. | | |

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 100 | |
| 28 | 100 | |
| 20 | 99 | |
| 14 | 95 | |
| 10 | 93 | |
| 6.3 | 91 | |
| 5 | 90 | |
| 3.35 | 88 | |
| 2 | 85 | |
| 1.18 | 82 | SAND |
| 0.6 | 79 | |
| 0.425 | 75 | |
| 0.3 | 71 | |
| 0.15 | 59 | |
| 0.063 | 48 | SILT/CLAY |
| 0.037 | 39 | |
| 0.027 | 35 | |
| 0.017 | 30 | |
| 0.010 | 27 | |
| 0.007 | 22 | |
| 0.005 | 19 | |
| 0.002 | 12 | |



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

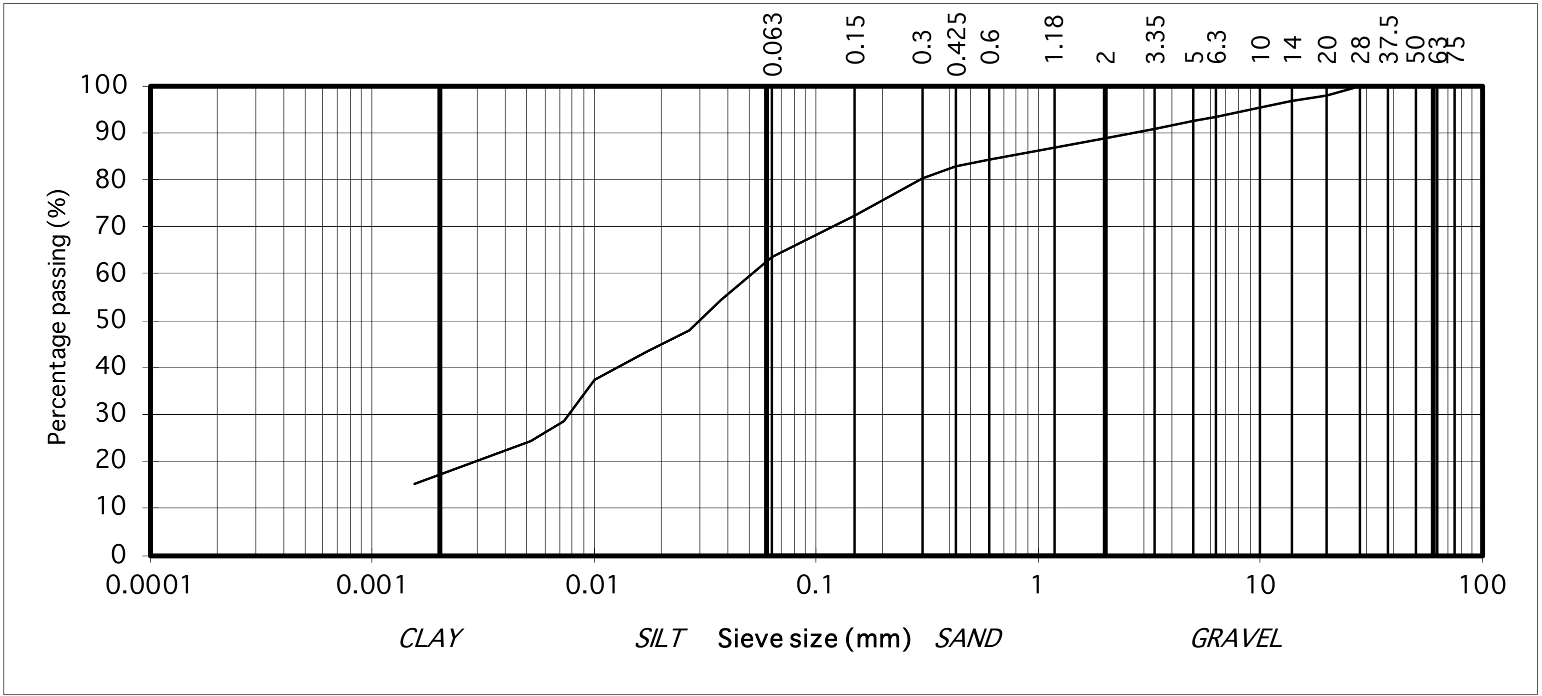
# TEST REPORT
## Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025
INAB ACCREDITED
TESTING
DETAILED IN SCOPE REG NO.133T

Contract No. 23158 Report No. R120754
Contract Name: Curragh Farm , Ballymanny , Newbridge , Co.Kildare
BH/TP : TP108
Sample No. AA145487 Lab. Sample No. A21/1304
Sample Type: B
Depth (m) 0.50 Customer: Neville Homes ltd
Date Received 18/03/2021 Date Testing started 29/03/2021
Description: Brown slightly sandy, slightly gravelly, CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received.

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 100 | |
| 28 | 100 | |
| 20 | 98 | |
| 14 | 97 | |
| 10 | 95 | |
| 6.3 | 93 | |
| 5 | 93 | |
| 3.35 | 91 | |
| 2 | 89 | |
| 1.18 | 87 | SAND |
| 0.6 | 84 | |
| 0.425 | 83 | |
| 0.3 | 80 | |
| 0.15 | 72 | |
| 0.063 | 64 | SILT/CLAY |
| 0.037 | 54 | |
| 0.027 | 48 | |
| 0.017 | 43 | |
| 0.010 | 37 | |
| 0.007 | 28 | |
| 0.005 | 24 | |
| 0.002 | 15 | |



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| | 26/04/21 | 1 of 1 |

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

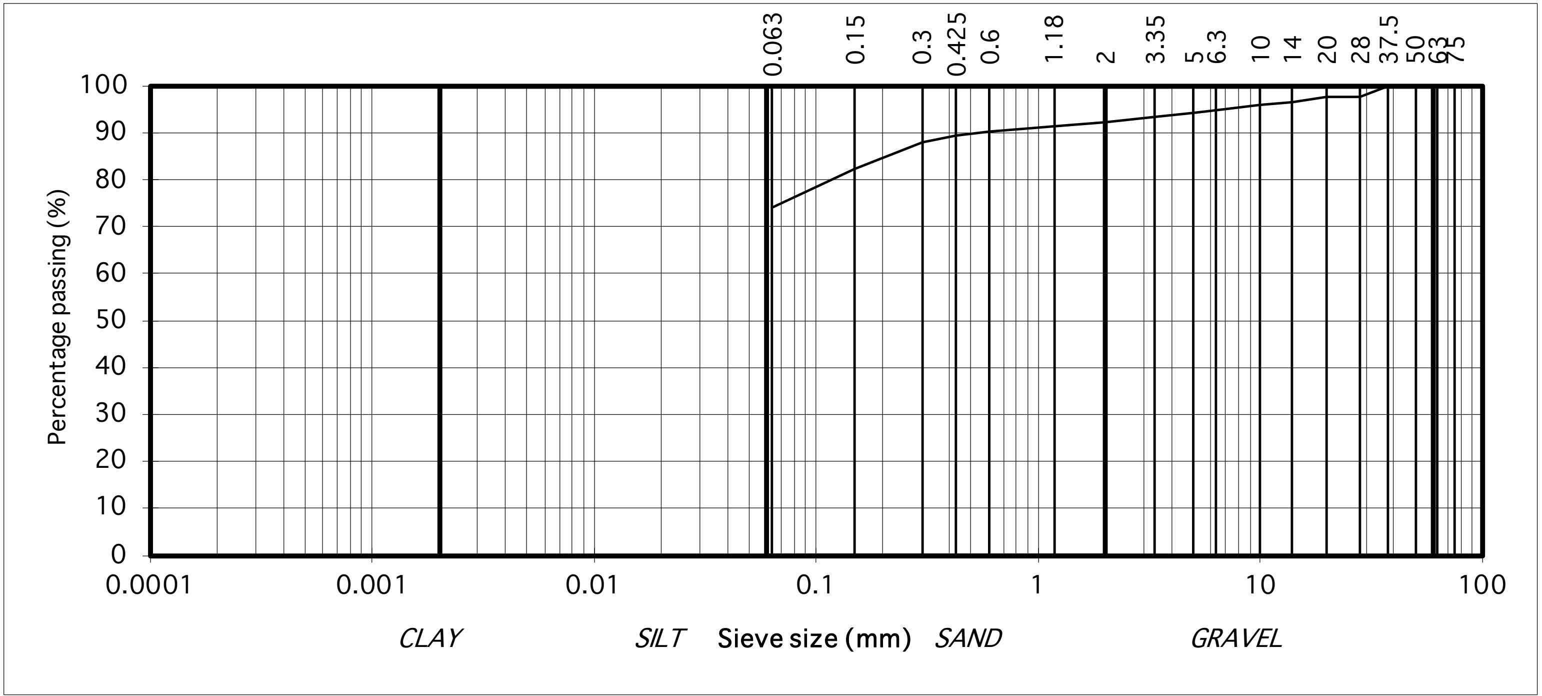
# TEST REPORT
## Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO.133T

| particle size | % passing | |
|---|---|---|
| 75 | 100 | COBBLES |
| 63 | 100 | |
| 50 | 100 | GRAVEL |
| 37.5 | 100 | |
| 28 | 98 | |
| 20 | 98 | |
| 14 | 97 | |
| 10 | 96 | |
| 6.3 | 95 | |
| 5 | 94 | |
| 3.35 | 93 | |
| 2 | 92 | |
| 1.18 | 91 | SAND |
| 0.6 | 90 | |
| 0.425 | 89 | |
| 0.3 | 88 | |
| 0.15 | 82 | |
| 0.063 | 74 | SILT/CLAY |

Contract No. 23158 Report No. R120595
Contract Name: Curragh Farm , Ballymanny , Newbridge , Co.Kildare
BH/TP : TP108
Sample No. AA145488 Lab. Sample No. A21/1305
Sample Type: B
Depth (m) 1.30 Customer: Neville Homes ltd
Date Received 18/03/2021 Date Testing started 29/03/2021
Description: Brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received.



**IGSL Ltd Materials Laboratory**

| Approved by: | Date: | Page no: |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

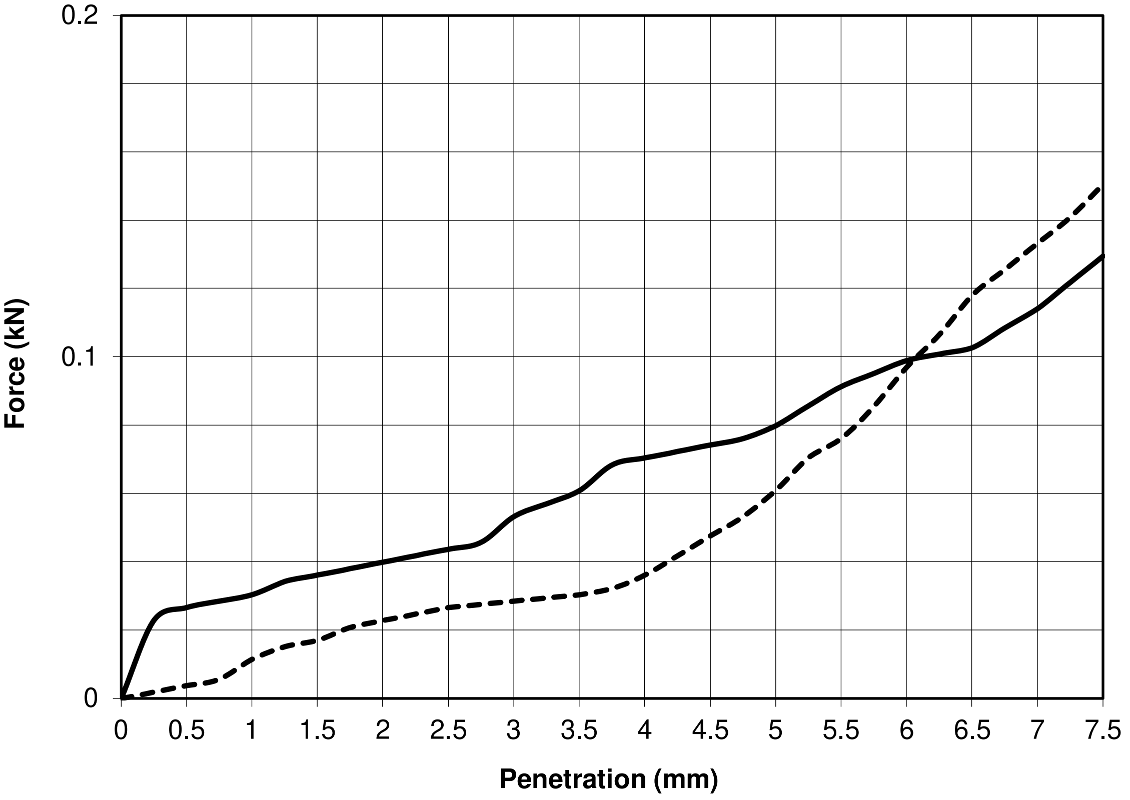
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

| | | | |
|---|---|---|---|
| Report No. | R120313 | Contract | Curragh Farm , Ballymanny ,<br>Newbridge,Co.Kildare |
| Contract No. | 23158 | Customer | Neville Homes Ltd |
| Date received | 18/03/21 | Date Tested | 08/04/21 |
| BH/TP No. | TP101 | Sample No. | AA140476 Type: B |
| Depth (m) | 0.50 | Lab sample No. | A21/1279 |



Key: ———— Top ---------------- Base

Description: Brown sandy, SILT

Initial Condition: Unsoaked
Moisture Content (%): 20 Bulk Density (Mg/m$^3$): 2.02
Surcharge (kg): 4 Dry Density (Mg/m$^3$): 1.69
% Material >20mm: 0
Method of compaction: Static Compaction Method 2

| Test Result | Top | Base |
|---|---|---|
| **CBR %** | **0.4** | **0.3** |
| Moisture Content % | 20 | 20 |

Results apply to sample as received.

Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

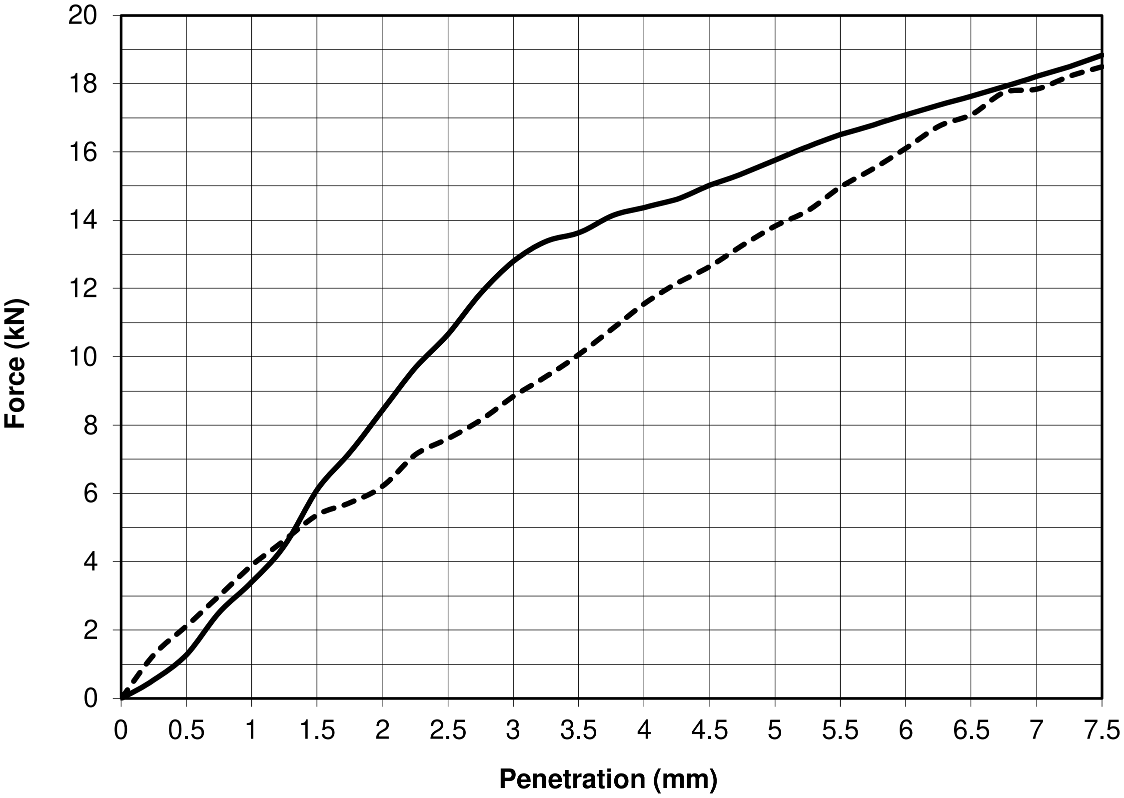
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No. R120314
Contract Curragh Farm , Ballymanny , Newbridge,Co.Kildare
Contract No. 23158
Customer Neville Homes Ltd
Date received 18/03/21
Date Tested 08/04/21
BH/TP No. TP102
Sample No. AA140482 Type: B
Depth (m) 0.50
Lab sample No. A21/1282



Key: ———— Top ---------------- Base

Description: Brown clayey/silty, very gravelly, SAND

Initial Condition: Unsoaked
Moisture Content (%): 11
Bulk Density (Mg/m$^3$): 2.08
Surcharge (kg): 4
Dry Density (Mg/m$^3$): 1.88
% Material >20mm: 7.4
Method of compaction: Static Compaction Method 2

| Test Result | **Top** | **Base** |
|---|---|---|
| **CBR %** | **81** | **69** |
| Moisture Content % | 11 | 11 |

Results apply to sample as received.

Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
| | 12/04/21 | 1 of 1 |

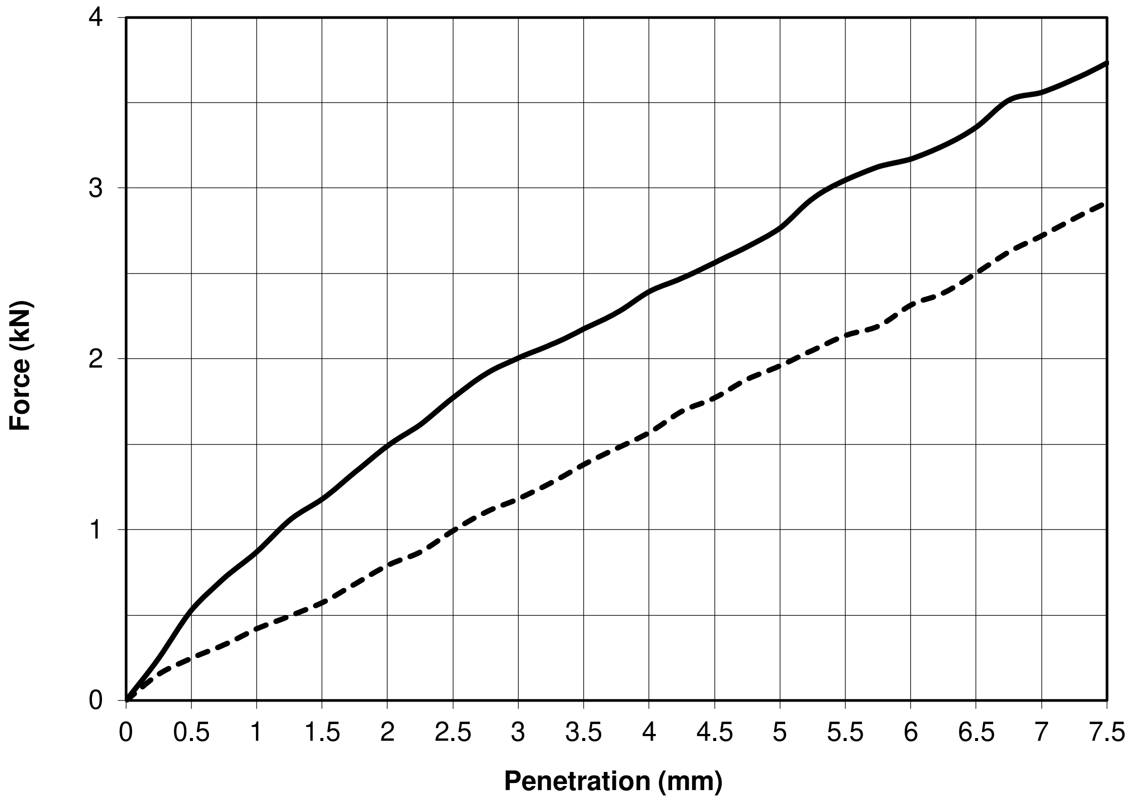
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

INAB ISO 17025 ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No. R120315
Contract Curragh Farm , Ballymanny , Newbridge,Co.Kildare
Contract No. 23158
Customer Neville Homes Ltd
Date received 18/03/21
Date Tested 08/04/21
BH/TP No. TP104
Sample No. AA140496 Type: B
Depth (m) 0.50
Lab sample No. A21/1289



Key: ———— Top ---------------- Base

Description: Brown slightly sandy, slightly gravelly, CLAY

Initial Condition: Unsoaked
Moisture Content (%): 15
Bulk Density ($Mg/m^3$): 2.10
Surcharge (kg): 4
Dry Density ($Mg/m^3$): 1.82
% Material >20mm: 1.4
Method of compaction: Static Compaction Method 2

| Test Result | Top | Base |
|---|---|---|
| **CBR %** | **14** | **10** |
| Moisture Content % | 15 | 15 |

Results apply to sample as received.

Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

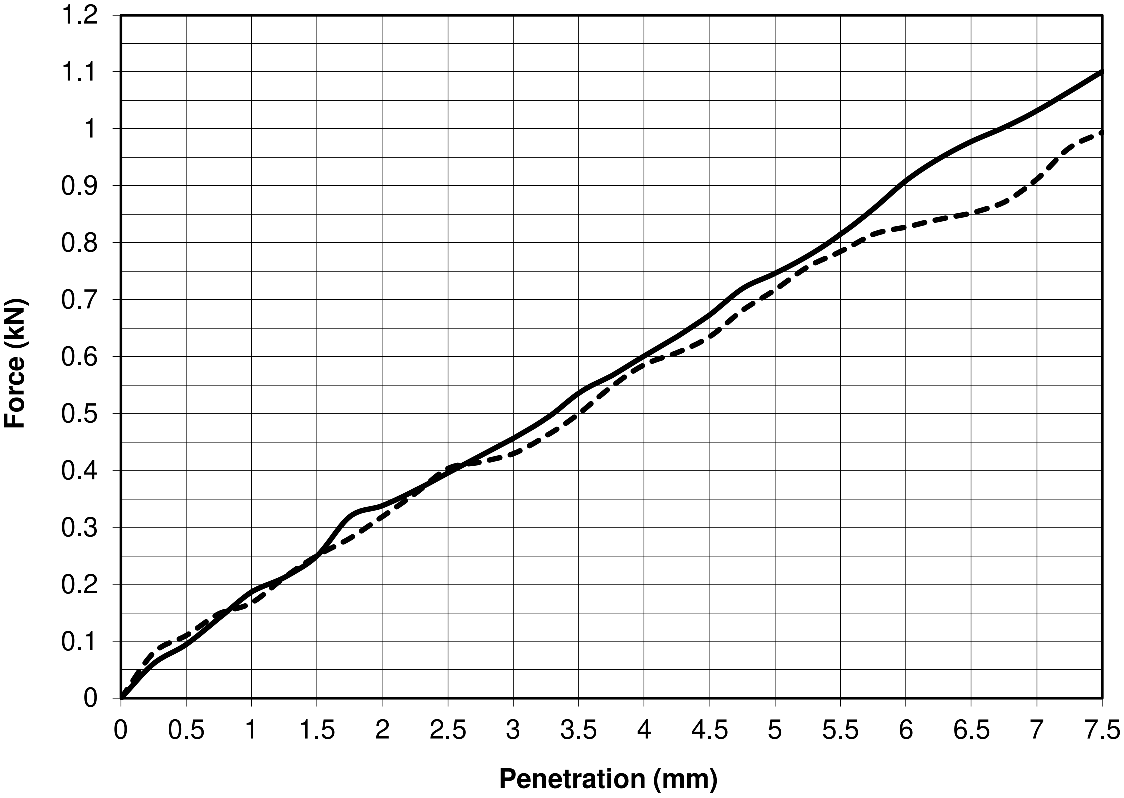
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

| | | | | | |
|---|---|---|---|---|---|
| Report No. | R120316 | Contract | Curragh Farm , Ballymanny ,<br>Newbridge,Co.Kildare | | |
| Contract No. | 23158 | Customer | Neville Homes Ltd | | |
| Date received | 18/03/21 | Date Tested | 08/04/21 | | |
| BH/TP No. | TP105 | Sample No. | AA157301 | Type: | B |
| Depth (m) | 0.50 | Lab sample No. | | A21/1293 | |



Key: ———— Top ---------------- Base

Description: Brown slightly sandy, slightly gravelly, CLAY

| | | | |
|---|---|---|---|
| Initial Condition: | Unsoaked | | |
| Moisture Content (%): | 17 | Bulk Density (Mg/m$^3$): | 2.14 |
| Surcharge (kg): | 4 | Dry Density (Mg/m$^3$): | 1.83 |
| % Material >20mm: | 0 | | |
| Method of compaction: | Static Compaction Method 2 | | |

| Test Result | Top | Base |
|---|---|---|
| **CBR %** | **3.7** | **3.6** |
| Moisture Content % | 17 | 17 |

Results apply to sample as received.

Persons authorized to approve reports

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

| Approved by | Date | Page No. |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

IGSL Ltd Materials Laboratory

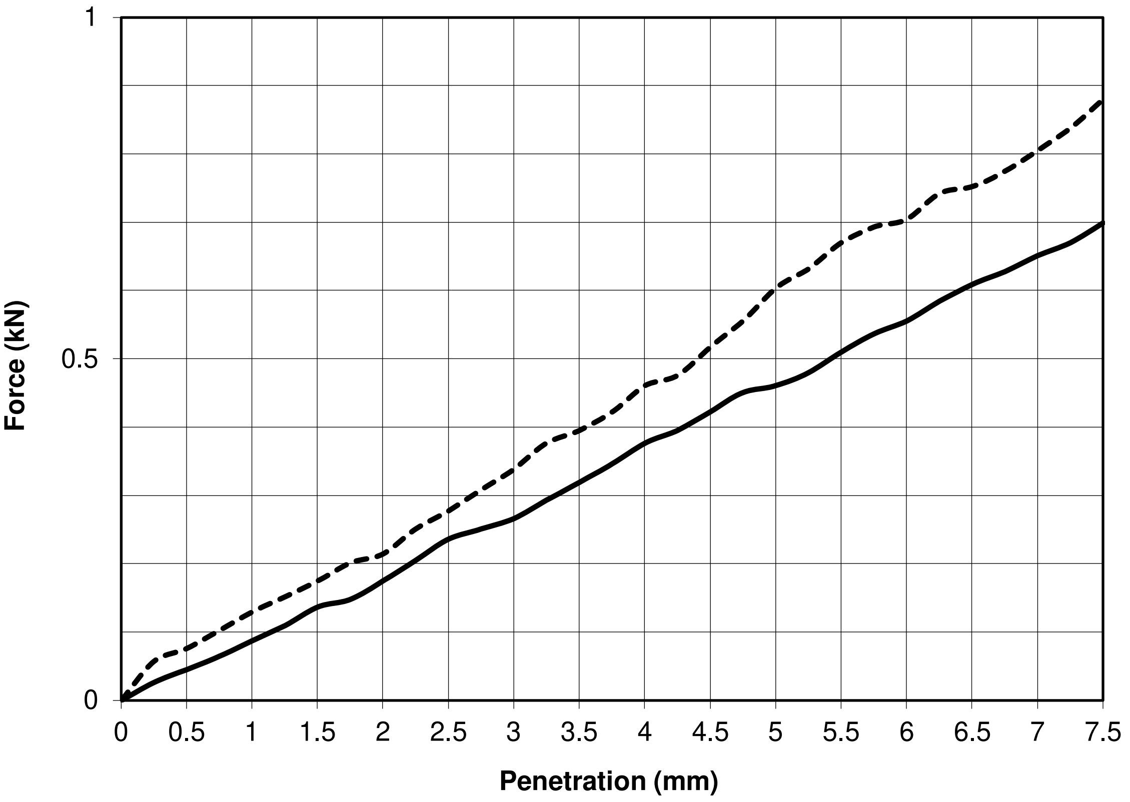
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025 INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO.133T

| | | | | | |
|---|---|---|---|---|---|
| Report No. | R120317 | Contract | Curragh Farm , Ballymanny ,<br>Newbridge,Co.Kildare | | |
| Contract No. | 23158 | Customer | Neville Homes Ltd | | |
| Date received | 18/03/21 | Date Tested | 08/04/21 | | |
| BH/TP No. | TP106 | Sample No. | AA145493 | Type: | B |
| Depth (m) | 0.50 | Lab sample No. | A21/1296 | | |



Key: ———— Top ---------------- Base

Description: Brown sandy, slightly gravelly, CLAY

| | | | |
|---|---|---|---|
| Initial Condition: | Unsoaked | | |
| Moisture Content (%): | 15 | Bulk Density (Mg/m$^3$): | 2.17 |
| Surcharge (kg): | 4 | Dry Density (Mg/m$^3$): | 1.88 |
| % Material >20mm: | 0 | | |
| Method of compaction: | Static Compaction Method 2 | | |

| Test Result | Top | Base |
|---|---|---|
| **CBR %** | **2.3** | **3.0** |
| Moisture Content % | 16 | 15 |

Results apply to sample as received.

Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
| | 12/04/21 | 1 of 1 |

| | | |
|---|---|---|
| IGSL Ltd<br>Materials Laboratory<br>Unit J5,M7 Business Park<br>Naas Co.Kildare<br>045 899324 | TEST REPORT<br>Determination of California Bearing Ratio (CBR)<br><br>Tested in accordance with BS1377:Part 4:1990, clause 7 | ISO 17025 INAB ACCREDITED TESTING<br>DETAILED IN SCOPE REG NO.133T |

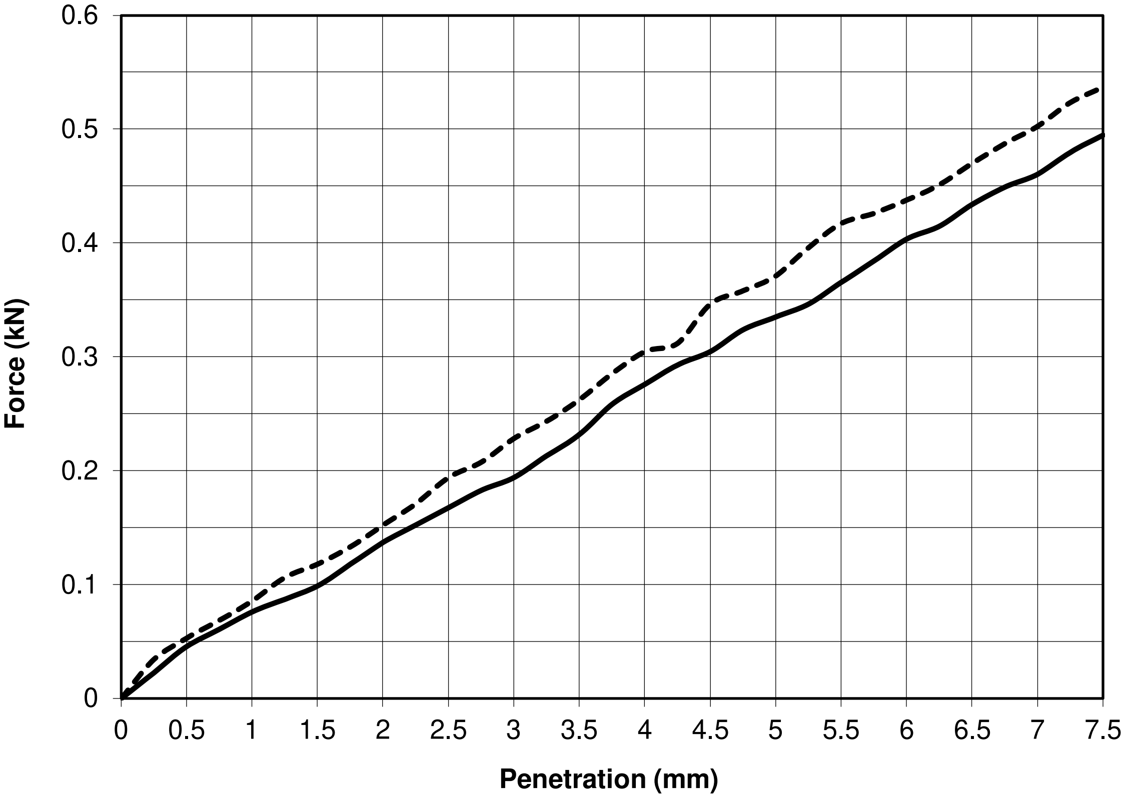
Report No. R120318 Contract Curragh Farm , Ballymanny , Newbridge,Co.Kildare

Contract No. 23158 Customer Neville Homes Ltd

Date received 18/03/21 Date Tested 08/04/21

BH/TP No. TP107 Sample No. AA145479 Type: B

Depth (m) 0.50 Lab sample No. A21/1282



Key: ———————— Top ---------------- Base

Description: Brown slightly sandy, slightly gravelly, SILT

Initial Condition: Unsoaked
Moisture Content (%): 21 Bulk Density (Mg/m$^3$): 2.05
Surcharge (kg): 4 Dry Density (Mg/m$^3$): 1.69
% Material >20mm: 4.8
Method of compaction: Static Compaction Method 2

| Test Result | **Top** | **Base** |
|---|---|---|
| **CBR %** | **1.7** | **1.9** |
| Moisture Content % | 21 | 21 |

Results apply to sample as received.

Persons authorized to approve reports

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
| | 26/04/21 | 1 of 1 |

IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No. R120319

Contract Curragh Farm , Ballymanny , Newbridge,Co.Kildare

Contract No. 23158

Customer Neville Homes Ltd

Date received 18/03/21

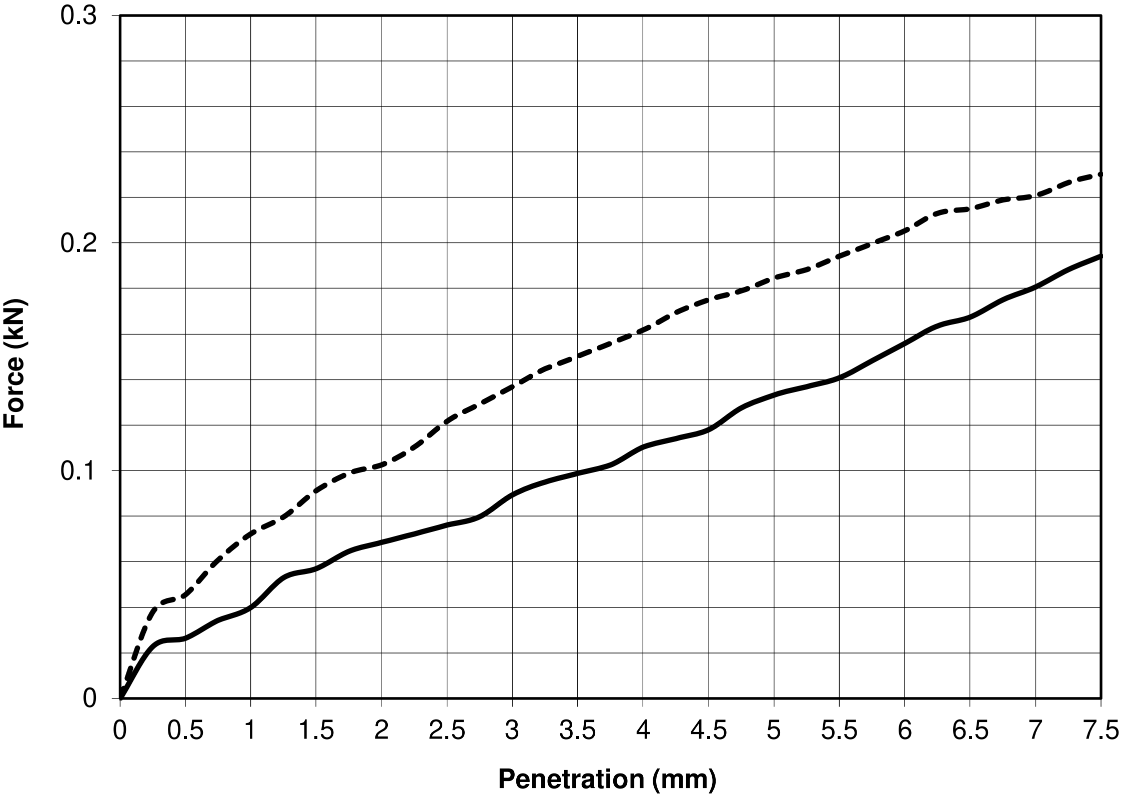
Date Tested 08/04/21

BH/TP No. TP108

Sample No. AA145487 Type: B

Depth (m) 0.50

Lab sample No. A21/1304



Key: ———— Top ---------------- Base

| | |
|---|---|
| Description: | Brown slightly sandy, slightly gravelly, CLAY |

Initial Condition: Unsoaked

Moisture Content (%): 22

Bulk Density (Mg/m$^3$): 2.01

Surcharge (kg): 4

Dry Density (Mg/m$^3$): 1.64

% Material >20mm: 3.2

Method of compaction: Static Compaction Method 2

| Test Result | Top | Base |
|---|---|---|
| **CBR %** | **0.7** | **0.9** |
| Moisture Content % | 22 | 22 |

Results apply to sample as received.

Persons authorized to approve reports

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

| Approved by | Date | Page No. |
|---|---|---|
| H Byrne | 12/04/21 | 1 of 1 |

IGSL Ltd Materials Laboratory

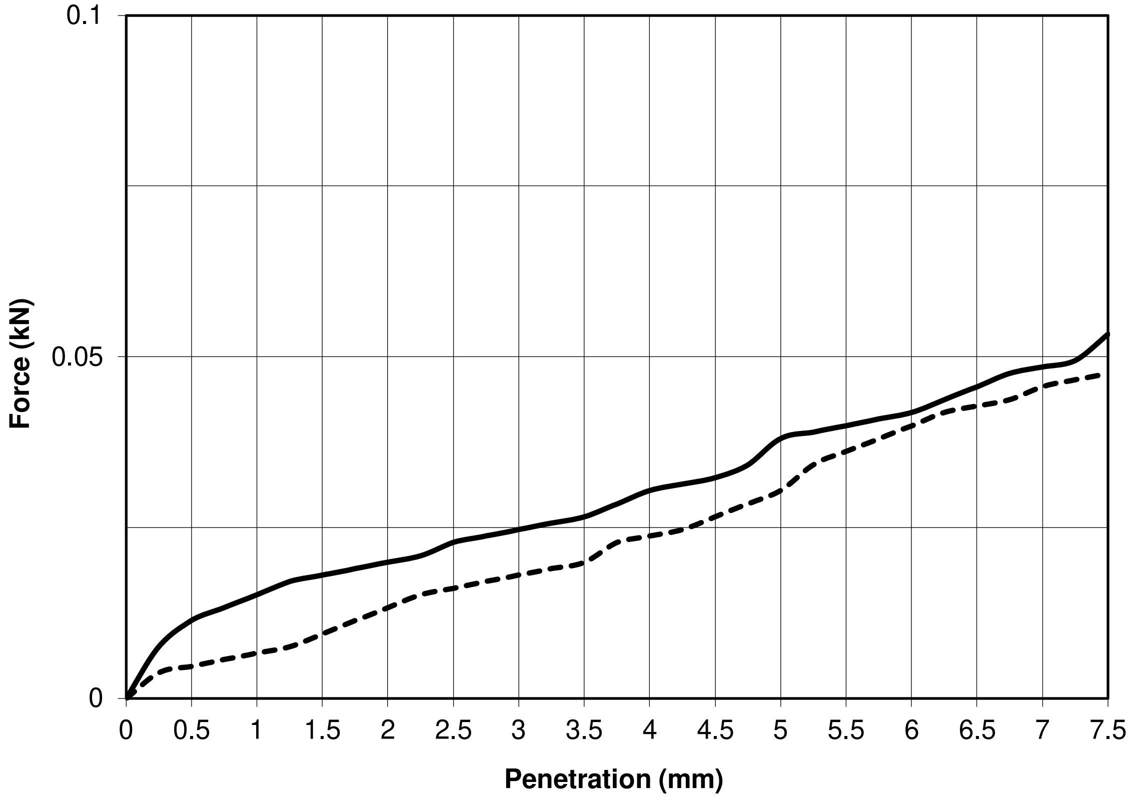
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

| | | | |
|---|---|---|---|
| Report No. | R120320 | Contract | Curragh Farm , Ballymanny , Newbridge,Co.Kildare |
| Contract No. | 23158 | Customer | Neville Homes Ltd |
| Date received | 18/03/21 | Date Tested | 08/04/21 |
| BH/TP No. | TP108 | Sample No. | AA145488 Type: B |
| Depth (m) | 0.50 | Lab sample No. | A21/1305 |



Key: ———— Top ---------------- Base

Description: Brown slightly sandy, slightly gravelly, SILT/CLAY

Initial Condition: Unsoaked
Moisture Content (%): 20 Bulk Density (Mg/m$^3$): 2.10
Surcharge (kg): 4 Dry Density (Mg/m$^3$): 1.75
% Material >20mm: 0
Method of compaction: Static Compaction Method 2

| Test Result | Top | Base |
|---|---|---|
| **CBR %** | **0.2** | **0.2** |
| Moisture Content % | 20 | 20 |

Results apply to sample as received.

Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
| H Byrne | 12/04/21 | 1 of 1 |

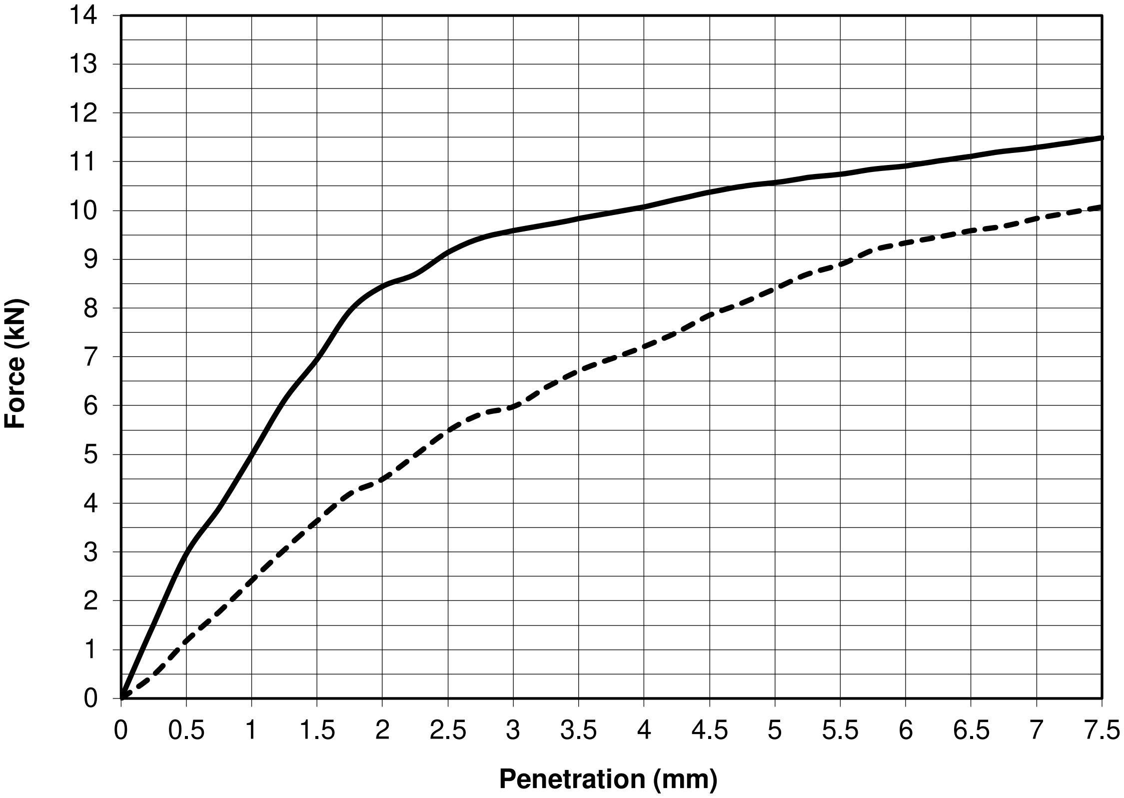
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

| | | | |
|---|---|---|---|
| Report No. | R120654 | Contract | Curragh Farm , Ballymany ,<br>Newbridge,Co.Kildare |
| Contract No. | 23158 | Customer | Neville Homes Ltd |
| Date received | 18/03/21 | Date Tested | 16/04/21 |
| BH/TP No. | SP01 | Sample No. | AA157311/14 Type: B |
| Depth (m) | 0.90-1.00 | Lab sample No. | A21/1577 |



Key: ———————— Top ---------------- Base

Description: Brown sandy, slightly gravelly, SILT

Initial Condition: Unsoaked
Moisture Content (%): 6
Bulk Density (Mg/m$^3$): 1.85
Surcharge (kg): 4
Dry Density (Mg/m$^3$): 1.65
% Material >20mm: 0
Method of compaction: Static Compaction Method 2

| Test Result | Top | Base |
|---|---|---|
| **CBR %** | **69** | **42** |
| Moisture Content % | 6 | 6 |

Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
| H Byrne | 21/04/21 | 1 of 1 |

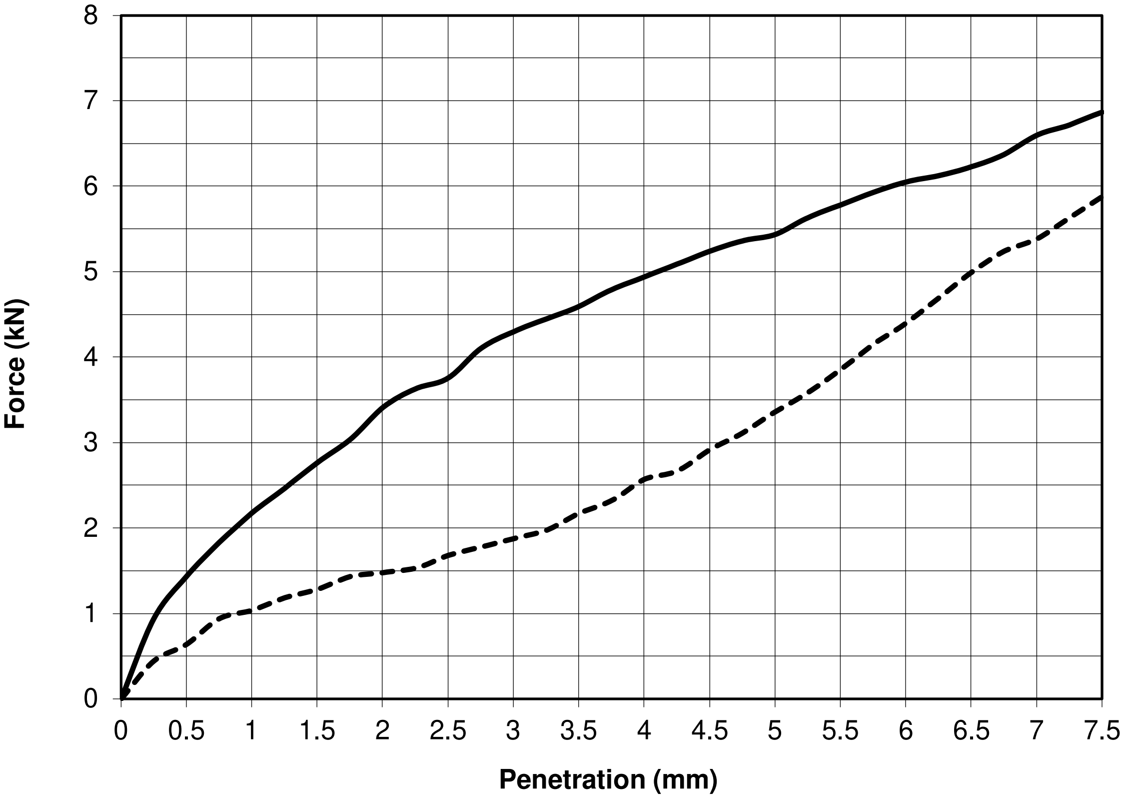
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025 INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO.1337

| | | | |
|---|---|---|---|
| Report No. | R120652 | Contract | Curragh Farm , Ballymanny ,<br>Newbridge,Co.Kildare |
| Contract No. | 23158 | Customer | Neville Homes Ltd |
| Date received | 18/03/21 | Date Tested | 15/04/21 |
| BH/TP No. | SP01 | Sample No. | A157311/1 |
| | | Type: | B |
| Depth (m) | 0.90-1.00 | Lab sample No. | A21/1577 |



Key: ———— Top ---------------- Base

Description: Brown sandy, slightly gravelly, SILT

Initial Condition: Unsoaked
Moisture Content (%): 12 Bulk Density ($Mg/m^3$): 1.66
Surcharge (kg): 4 Dry Density ($Mg/m^3$): 1.57
% Material >20mm: 0
Method of compaction: Static Compaction Method 2

| Test Result | Top | Base |
|---|---|---|
| **CBR %** | **28** | **17** |
| Moisture Content % | 12 | 12 |

Natural

Persons authorized to approve reports

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
| H Byrne | 21/04/21 | 1 of 1 |

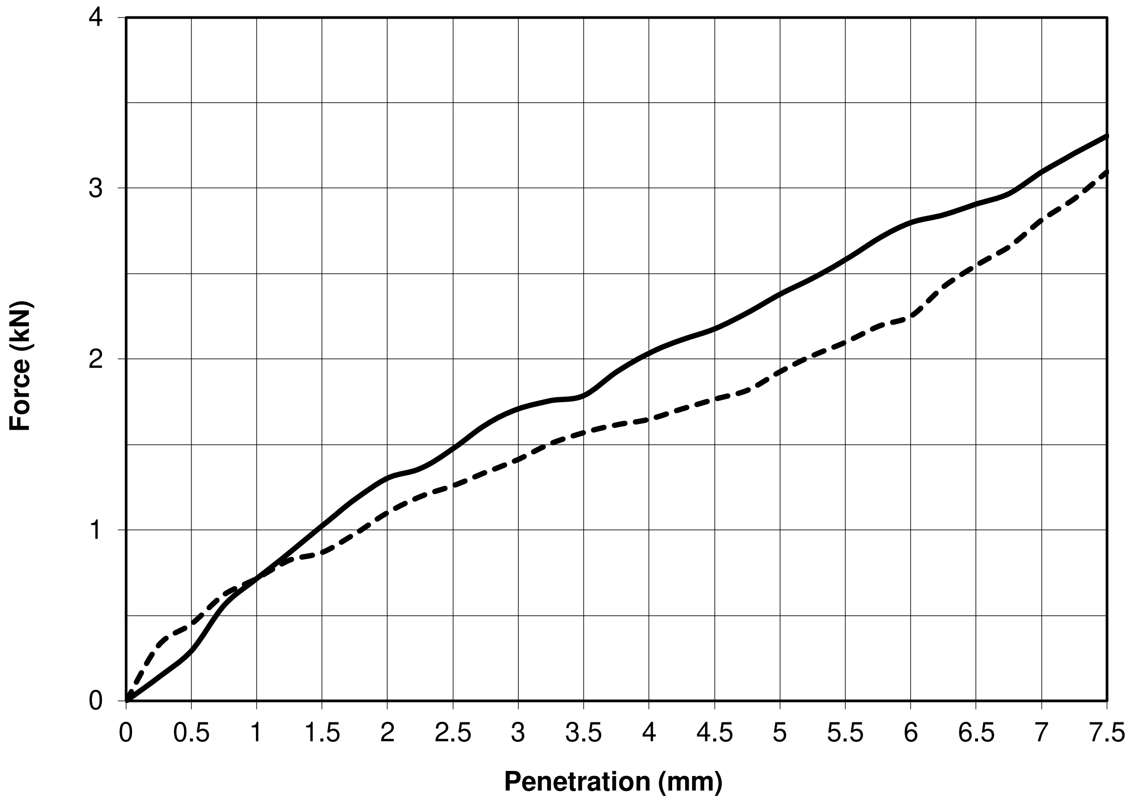
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025
INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO.133T

Report No. R120655
Contract Curragh Farm , Ballymany , Newbridge,Co.Kildare
Contract No. 23158
Customer Neville Homes Ltd
Date received 18/03/21
Date Tested 19/04/21
BH/TP No. SP01
Sample No. AA157311/14
Type: B
Depth (m) 0.90-1.00
Lab sample No. A21/1577



Key: ——— Top ----------------- Base

Description: Brown sandy, slightly gravelly, SILT

Initial Condition: Unsoaked
Moisture Content (%): 14
Bulk Density (Mg/m$^3$): 1.87
Surcharge (kg): 4
Dry Density (Mg/m$^3$): 1.64
% Material >20mm: 0
Method of compaction: Static Compaction Method 2

| Test Result | **Top** | **Base** |
|---|---|---|
| **CBR %** | **12** | **10** |
| Moisture Content % | 14 | 14 |

Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
|  | 21/04/21 | 1 of 1 |

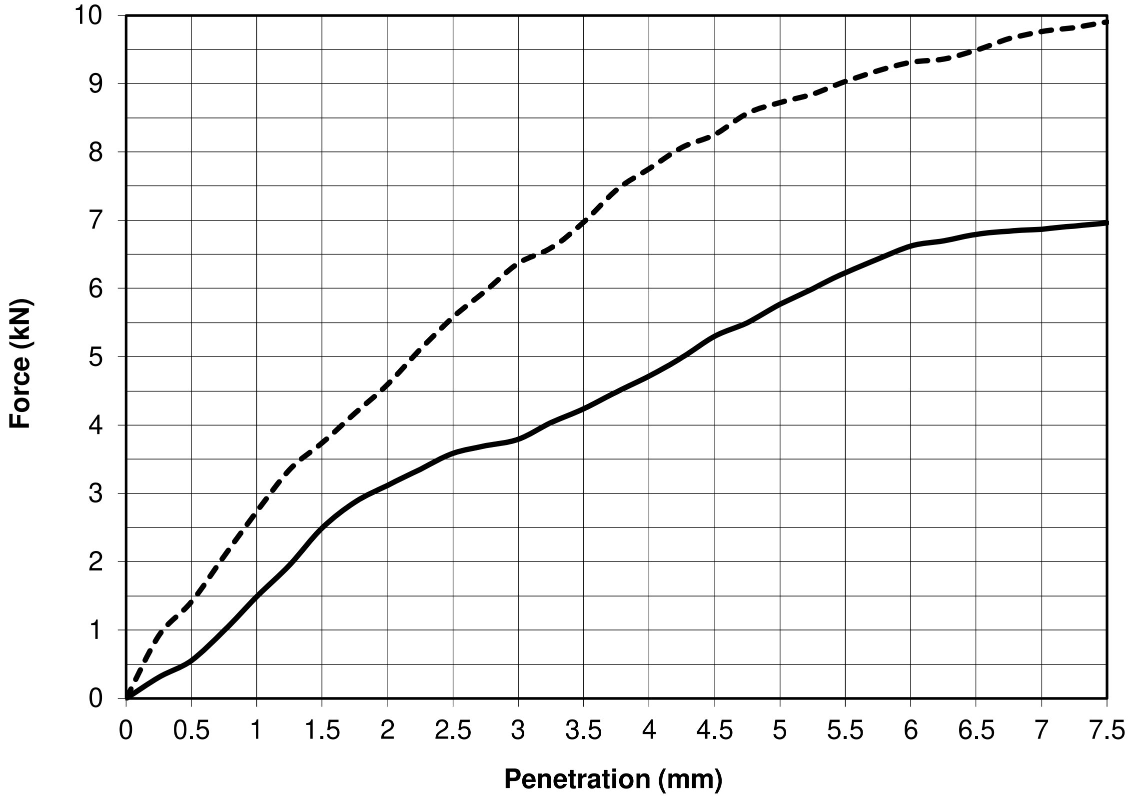
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
## Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

|  |  |  |  |
|---|---|---|---|
| Report No. | R120651 | Contract | Curragh Farm , Ballymanny ,<br>Newbridge,Co.Kildare |
| Contract No. | 23158 | Customer | Neville Homes Ltd |
| Date received | 18/03/21 | Date Tested | 15/04/21 |
| BH/TP No. | SP01 | Sample No. | AA157311/14 Type: B |
| Depth (m) | 0.90-1.00 | Lab sample No. | A21/1577 |



Key: ——————— Top ----------------- Base

Description: Brown sandy, slightly gravelly, SILT

Initial Condition: Unsoaked
Moisture Content (%): 10 Bulk Density (Mg/m$^3$): 1.79
Surcharge (kg): 4 Dry Density (Mg/m$^3$): 1.62
% Material >20mm: 0
Method of compaction: Static Compaction Method 2

| Test Result | Top | Base |
|---|---|---|
| **CBR %** | **29** | **44** |
| Moisture Content % | 10 | 10 |

Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
| H Byrne | 12/04/21 | 1 of 1 |

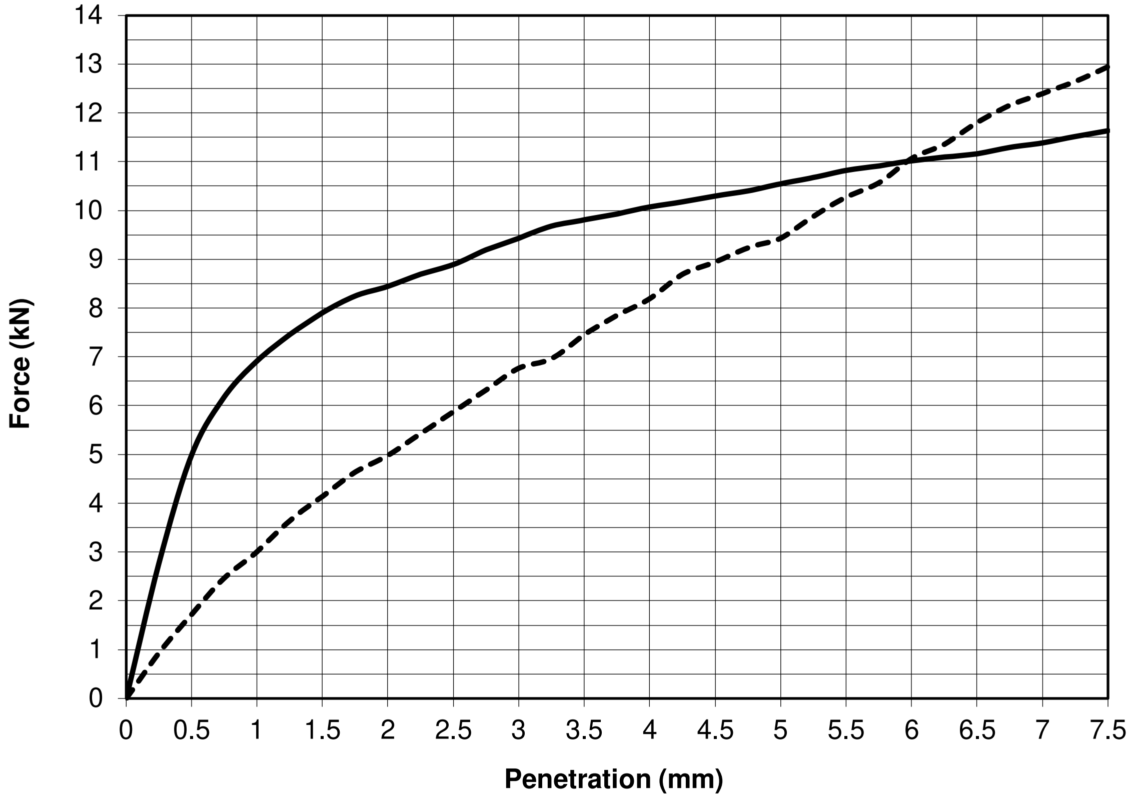
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No. R120653
Contract Curragh Farm , Ballymanny , Newbridge,Co.Kildare
Contract No. 23158
Customer Neville Homes Ltd
Date received 18/03/21
Date Tested 15/04/21
BH/TP No. SP01
Sample No. AA157311/14
Type: B
Depth (m) 0.90-1.00
Lab sample No. A21/1577



Key: ———— Top ---------------- Base

Description: Brown sandy, slightly gravelly, SILT

Initial Condition: Unsoaked
Moisture Content (%): 8
Bulk Density (Mg/m$^3$): 1.73
Surcharge (kg): 4
Dry Density (Mg/m$^3$): 1.60
% Material >20mm: 0
Method of compaction: Static Compaction Method 2

| Test Result | **Top** | **Base** |
|---|---|---|
| **CBR %** | **67** | **47** |
| Moisture Content % | 8 | 8 |

Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

## IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
|  | 21/04/21 | 1 of 1 |

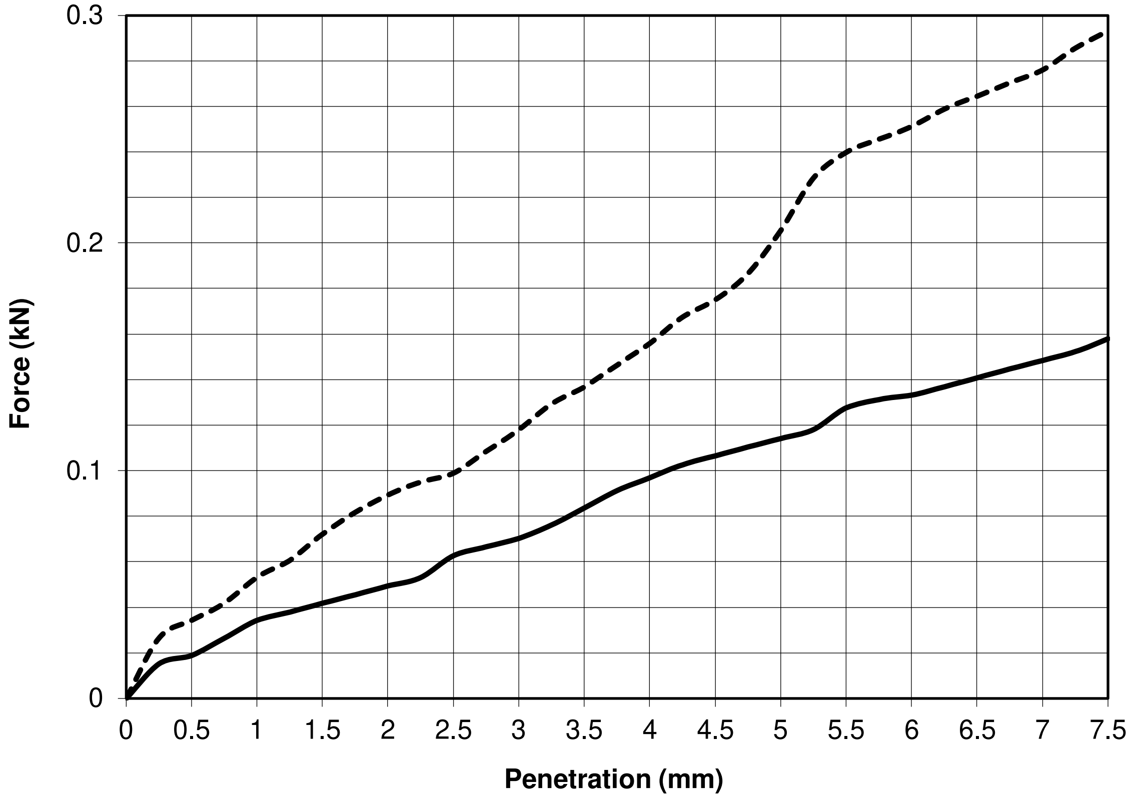
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
## Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

| | | | | | |
|---|---|---|---|---|---|
| Report No. | R120662 | Contract | Curragh Farm , Ballymanny ,<br>Newbridge,Co.Kildare | | |
| Contract No. | 23158 | Customer | Neville Homes Ltd | | |
| Date received | 18/03/21 | Date Tested | 19/04/21 | | |
| BH/TP No. | SP02 | Sample No. | AA157307-10 | Type: | B |
| Depth (m) | 0.90-1.00 | Lab sample No. | A21/1278 | | |



Key: ———— Top ----------------- Base

Description: Brown slightly sandy, gravelly, SILT

| | | | |
|---|---|---|---|
| Initial Condition: | Unsoaked | | |
| Moisture Content (%): | 13 | Bulk Density (Mg/m$^3$): | 2.21 |
| Surcharge (kg): | 4 | Dry Density (Mg/m$^3$): | 1.92 |
| % Material >20mm: | 22 | | |
| Method of compaction: | Static Compaction Method 2 | | |

| Test Result | **Top** | **Base** |
|---|---|---|
| **CBR %** | **0.6** | **1.0** |
| Moisture Content % | 13 | 13 |

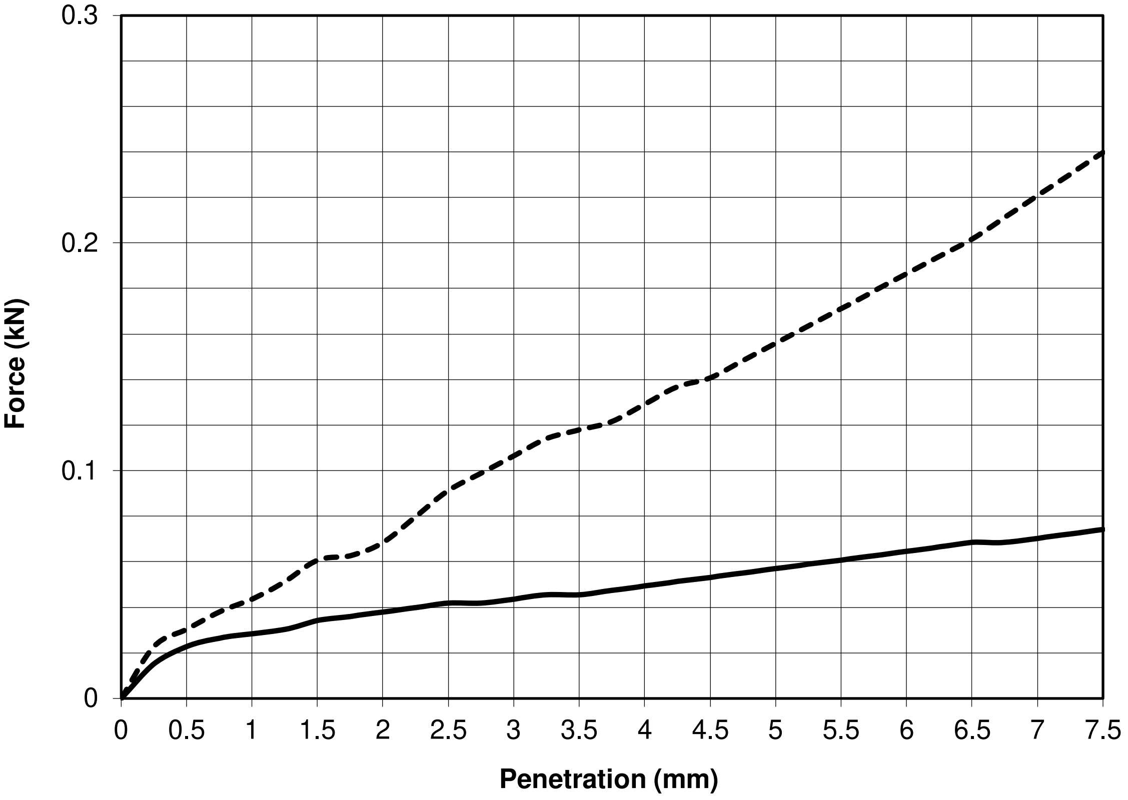
Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
| H Byrne | 22/04/21 | 1 of 1 |

| IGSL Ltd<br>Materials Laboratory<br>Unit J5,M7 Business Park<br>Naas Co.Kildare<br>045 899324 | TEST REPORT<br>Determination of California Bearing Ratio (CBR)<br>Tested in accordance with BS1377:Part 4:1990, clause 7 | INAB ISO 17025 ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T |
|---|---|---|

Report No. R120661
Contract Curragh Farm , Ballymanny , Newbridge,Co.Kildare
Contract No. 23158
Customer Neville Homes Ltd
Date received 18/03/21
Date Tested 19/04/21
BH/TP No. SP02
Sample No. AA157307-10 Type: B
Depth (m) 0.90-1.00
Lab sample No. A21/1278



Key: ———— Top ---------------- Base

Description: Brown slightly sandy, gravelly, SILT

Initial Condition: Unsoaked
Moisture Content (%): 15 Bulk Density (Mg/m$^3$): 2.27
Surcharge (kg): 4 Dry Density (Mg/m$^3$): 2.03
% Material >20mm: 21.8
Method of compaction: Static Compaction Method 2

| Test Result | **Top** | **Base** |
|---|---|---|
| **CBR %** | **0.3** | **0.8** |
| Moisture Content % | 15 | 15 |

Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

| IGSL Ltd Materials Laboratory | Approved by | Date | Page No. |
|---|---|---|---|
| | H Byrne | 22/04/21 | 1 of 1 |

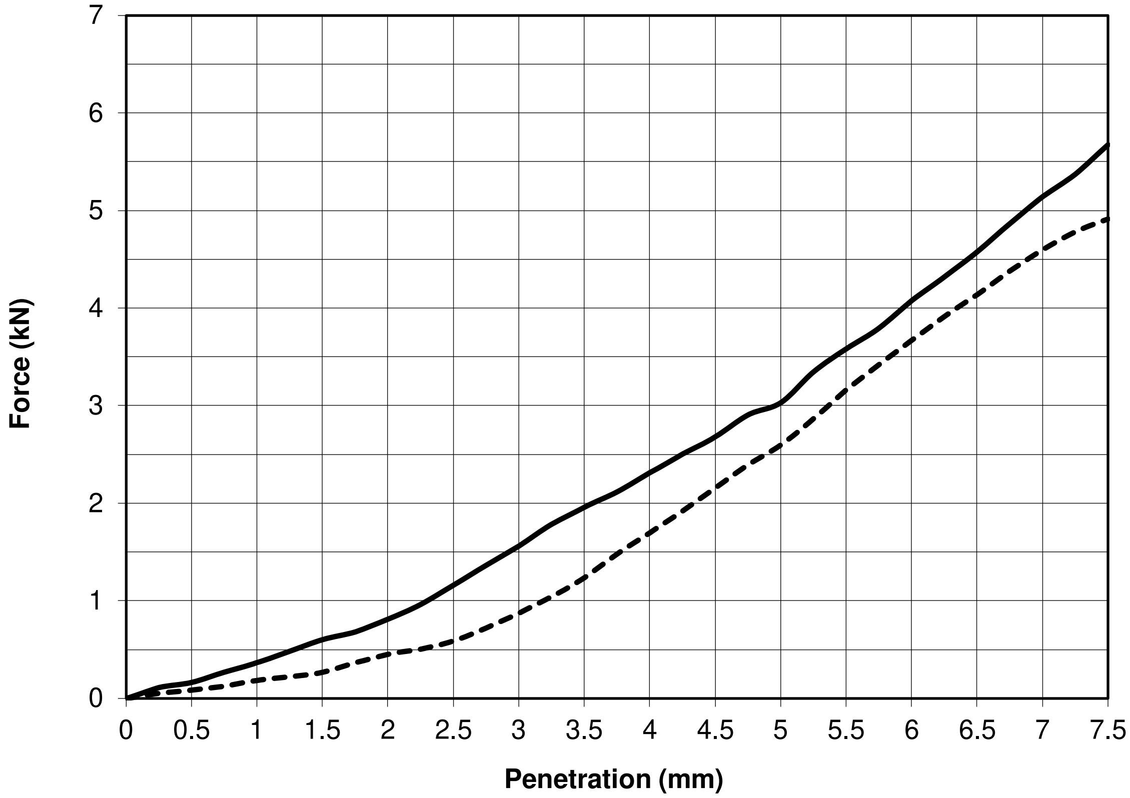
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

| | | | |
|---|---|---|---|
| Report No. | R120658 | Contract | Curragh Farm , Ballymanny ,<br>Newbridge,Co.Kildare |
| Contract No. | 23158 | Customer | Neville Homes Ltd |
| Date received | 18/03/21 | Date Tested | 15/04/21 |
| BH/TP No. | SP02 | Sample No. | AA157307-10 Type: B |
| Depth (m) | 0.90-1.00 | Lab sample No. | A21/1278 |



Key: ———— Top ---------------- Base

Description: Brown slightly sandy, gravelly, SILT

Initial Condition: Unsoaked
Moisture Content (%): 9 Bulk Density (Mg/m$^3$): 2.31
Surcharge (kg): 4 Dry Density (Mg/m$^3$): 2.12
% Material >20mm: 21.8
Method of compaction: Static Compaction Method 2

| Test Result | **Top** | **Base** |
|---|---|---|
| **CBR %** | **15** | **13** |
| Moisture Content % | 9 | 9 |

Natural

Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

| Approved by | Date | Page No. |
|---|---|---|
| H Byrne | 22/04/21 | 1 of 1 |

IGSL Ltd Materials Laboratory

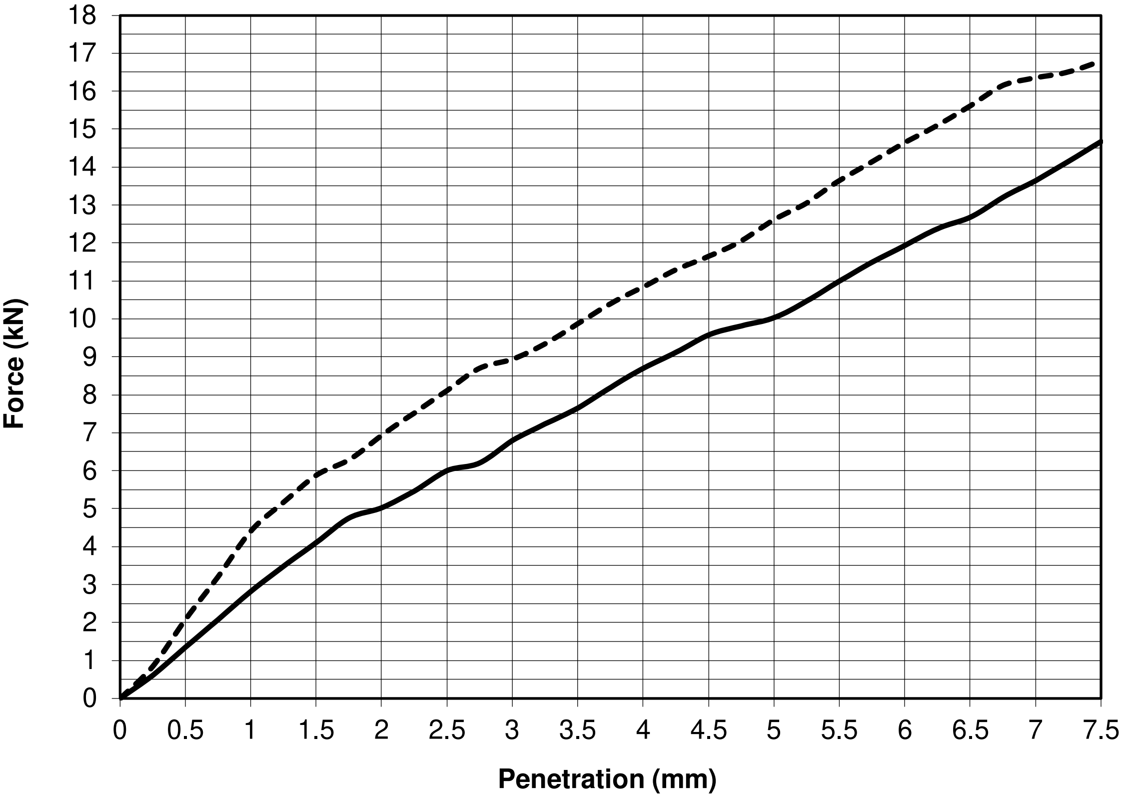
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

INAB ISO 17025 ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

| | | | |
|---|---|---|---|
| Report No. | R120659 | Contract | Curragh Farm , Ballymanny ,<br>Newbridge,Co.Kildare |
| Contract No. | 23158 | Customer | Neville Homes Ltd |
| Date received | 18/03/21 | Date Tested | 19/04/21 |
| BH/TP No. | SP02 | Sample No. | A157307-1( Type: B |
| Depth (m) | 0.90-1.00 | Lab sample No. | A21/1278 |



Key: ———— Top ---------------- Base

Description: Brown slightly sandy, gravelly, SILT

Initial Condition: Unsoaked
Moisture Content (%): 7
Bulk Density (Mg/m$^3$): 2.19
Surcharge (kg): 4
Dry Density (Mg/m$^3$): 2.05
% Material >20mm: 22
Method of compaction: Static Compaction Method 2

| Test Result | **Top** | **Base** |
|---|---|---|
| **CBR %** | **50** | **63** |
| Moisture Content % | 7 | 7 |

Persons authorized to approve reports

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
| H Byrne | 26/04/21 | 1 of 1 |

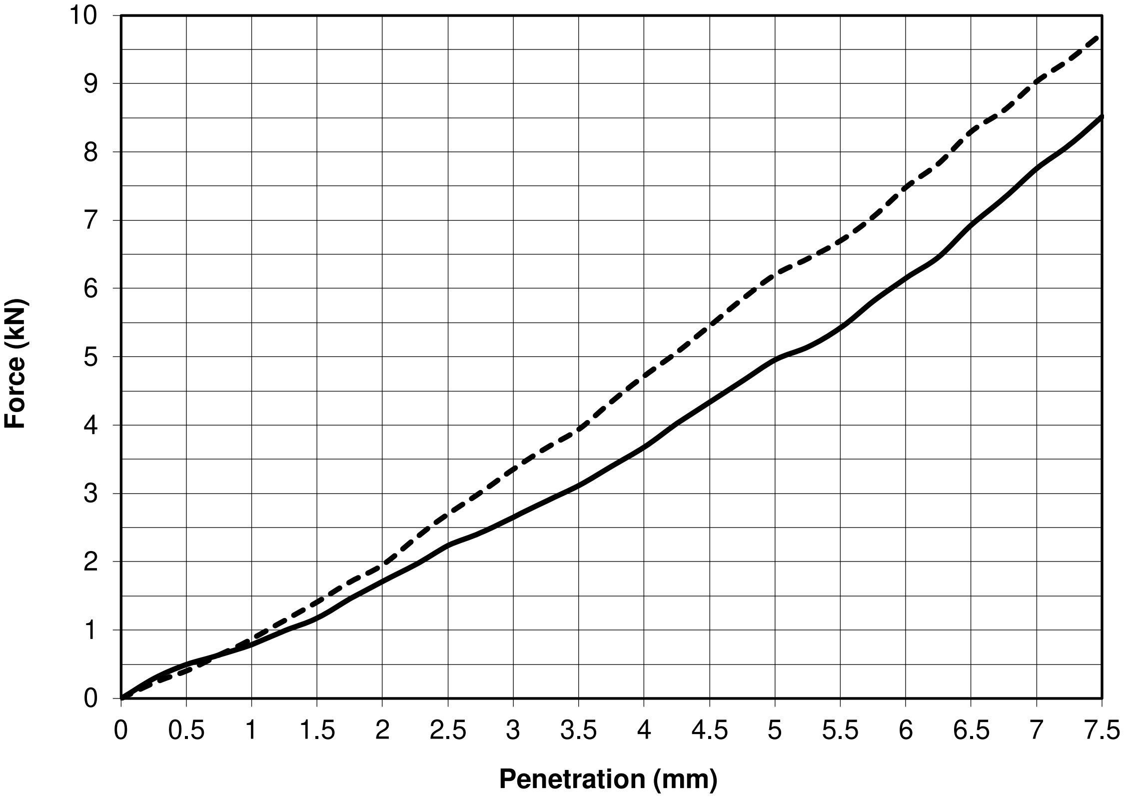
IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas Co.Kildare
045 899324

# TEST REPORT
# Determination of California Bearing Ratio (CBR)

Tested in accordance with BS1377:Part 4:1990, clause 7

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

| | | | | | |
|---|---|---|---|---|---|
| Report No. | R120660 | Contract | Curragh Farm , Ballymanny , Newbridge,Co.Kildare | | |
| Contract No. | 23158 | Customer | Neville Homes Ltd | | |
| Date received | 18/03/21 | Date Tested | 19/04/21 | | |
| BH/TP No. | SP02 | Sample No. | AA157307-10 | Type: | B |
| Depth (m) | 0.90-1.00 | Lab sample No. | A21/1278 | | |



Key: ———— Top ---------------- Base

Description: Brown slightly sandy, gravelly, SILT

Initial Condition: Unsoaked
Moisture Content (%): 8 Bulk Density (Mg/m$^3$): 2.25
Surcharge (kg): 4 Dry Density (Mg/m$^3$): 2.09
% Material >20mm: 22
Method of compaction: Static Compaction Method 2

| Test Result | Top | Base |
|---|---|---|
| **CBR %** | **25** | **31** |
| Moisture Content % | 8 | 8 |

Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory

| Approved by | Date | Page No. |
|---|---|---|
| H Byrne | 22/04/21 | 1 of 1 |

| | | |
|---|---|---|
| IGSL Ltd<br>Materials Laboratory<br>M7 Business Park<br>Naas Co.Kildare<br>045 846176 | TEST REPORT<br>Determination of MCV / moisture content<br>Relation of a soil<br><br>Tested in accordance with BS1377-4:1990, clause 5.5 | |

Report No. R120596

Contract Curragh Farms , Curragh , Co.Kildare

Contract No. 23158

Customer Neville Homes

Date received 18/03/21

Date Tested 14/04/21

BH/TP No. SP01

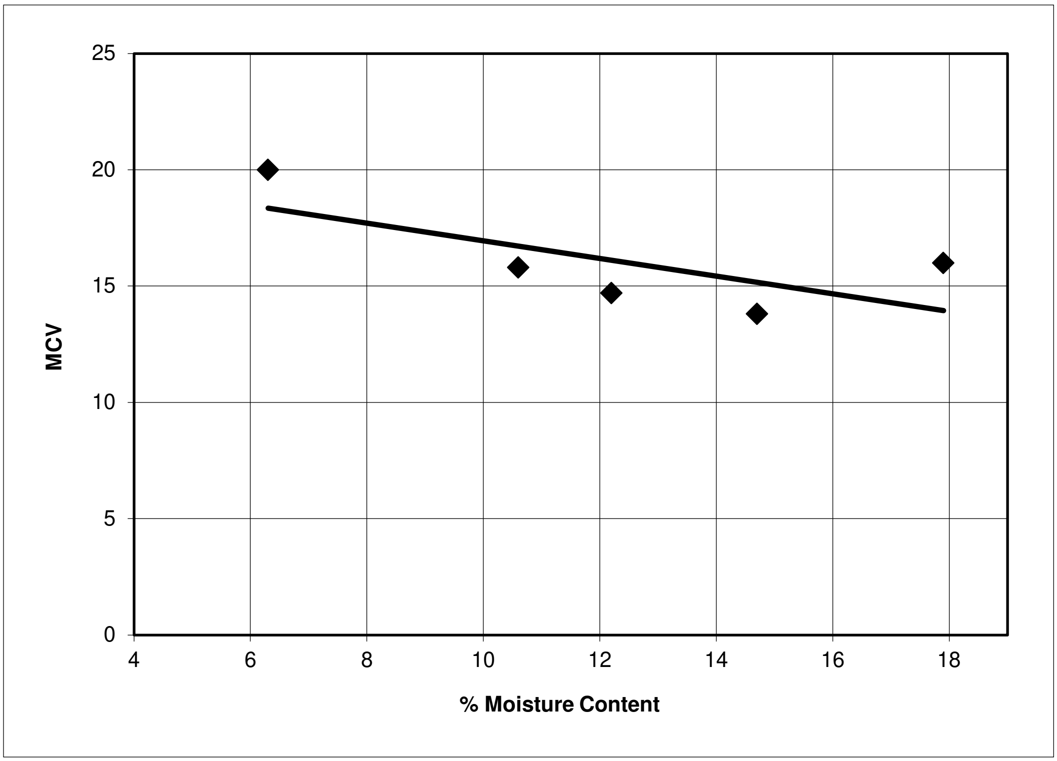
Sample No. AA157311-14

Type: B

Depth (m) 0.50-1.00

Lab sample No. A21/1277

| | | | | | |
|---|---|---|---|---|---|
| MC% | 18 | 15 | 12.2 | 10.6 | 6 |
| MCV | 16 | 13.8 | 14.7 | 15.8 | 20 |



% material >20mm 0.7

Persons authorized to approve reports

J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

| IGSL Ltd Materials Laboratory | Approved by | Date | Page No. |
|---|---|---|---|
| | H Byrne | 19/04/21 | 1 of 1 |

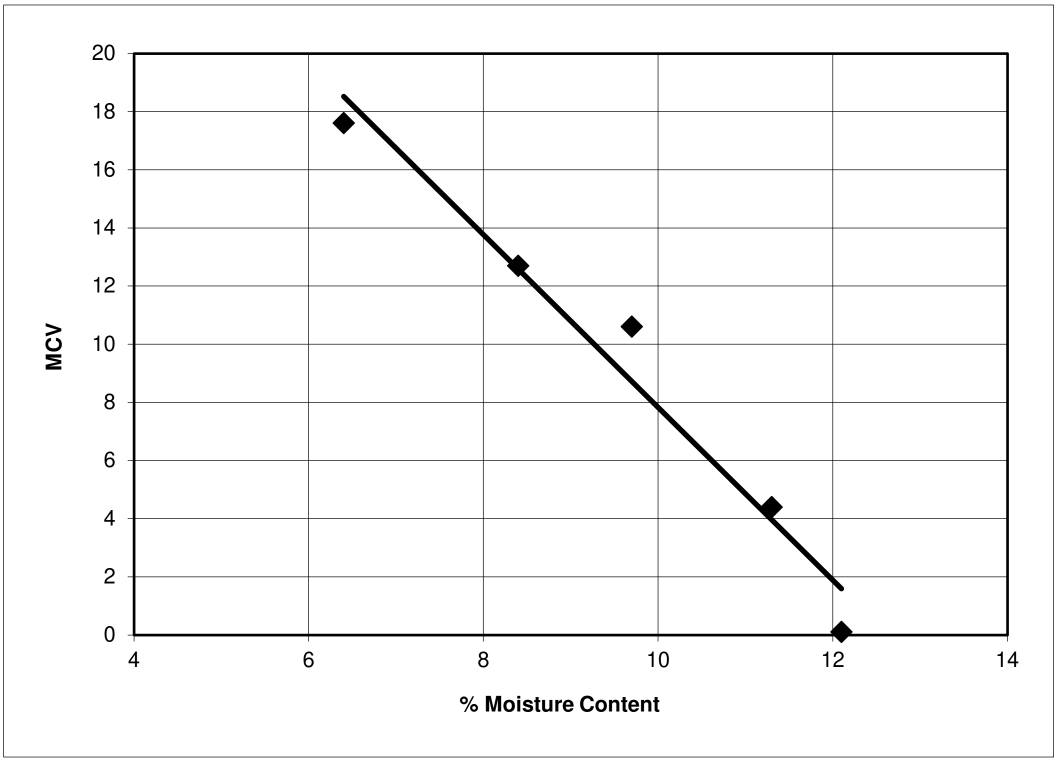
IGSL Ltd
Materials Laboratory
M7 Business Park
Naas Co.Kildare
045 846176

# TEST REPORT
# Determination of MCV / moisture content Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R120597
Contract Curragh Farms , Curragh , Co.Kildare
Contract No. 23158
Customer Neville Homes Ltd
Date received 18/03/21
Date Tested 14/04/21
BH/TP No. SP02
Sample No. A157307-1( Type: B
Depth (m) 0.50-1.00
Lab sample No. A21/1278

| | | | | | |
|---|---|---|---|---|---|
| MC% | 12 | 11 | 9.7 | 8.4 | 6 |
| MCV | 0.1 | 4.4 | 10.6 | 12.7 | 17.6 |



% material >20mm 23.2

Persons authorized to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

| Approved by | Date | Page No. |
|---|---|---|
| H Byrne | 19/04/21 | 1 of 1 |

IGSL Ltd Materials Laboratory

| | | |
|---|---|---|
| IGSL Ltd<br>Materials Laboratory<br>M7 Business Park<br>Naas<br>Co. Kildare | Test Report<br>Dry Density/Moisture Content Relationship<br>Tested in accordance with BS1377:Part 4:1990 | INAB ISO 17025 ACCREDITED TESTING<br>DETAILED IN SCOPE REG NO.133T |

Report No. R120650 Contract No. 23158

Contract Name: Curragh Farm , Ballymany , Newbridge,Co.Kildare

Lab Contract No. Location: SP01

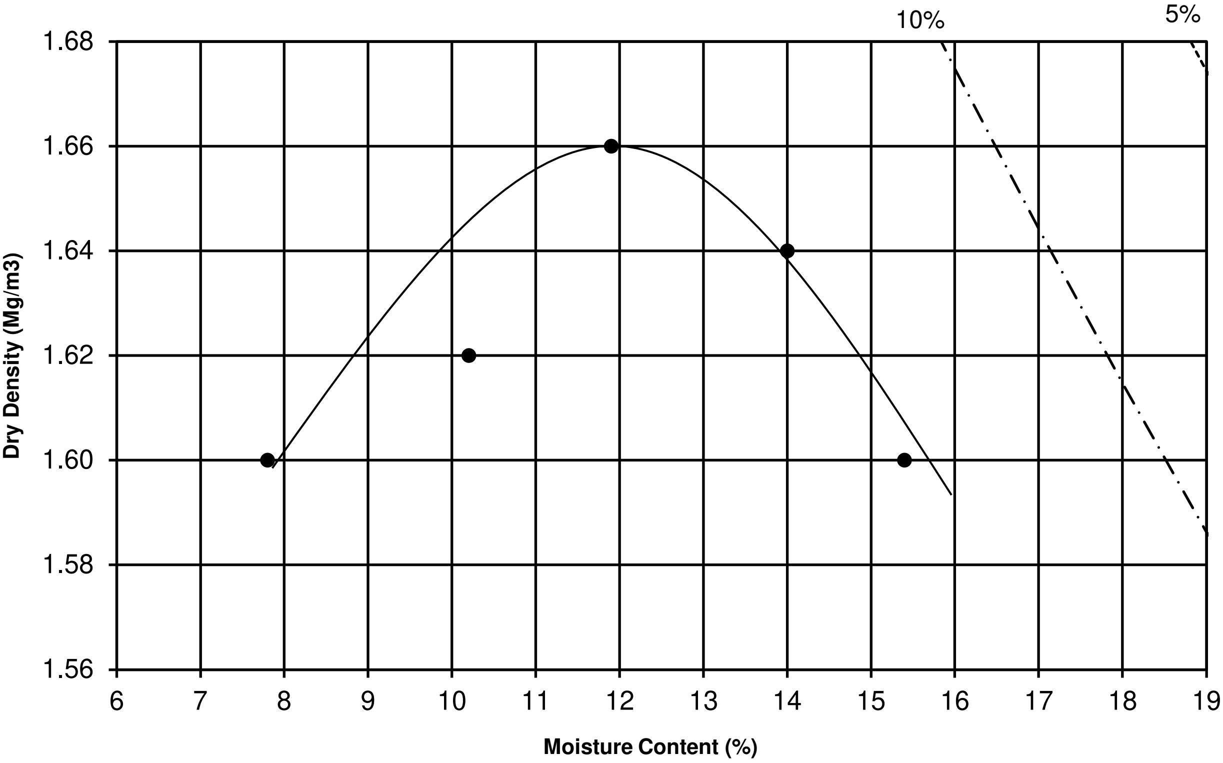
Sample No. AA157311-14 Depth (m) 0.90-1.00 Material Type B

Lab sample no. A21/1577 Customer: Neville Homes

Date Received: 18/03/2021 Test Method: 2.5 KG Rammer

Date Tested: 15/04/2021 BS1377:Part 4:1990 3.3

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dry Density (Mg/m$^3$) | 1.62 | 1.58 | 1.60 | 1.66 | 1.64 | 1.60 | |
| Moisture Content (%) | 10 | 5.9 | 7.8 | 12 | 14 | 15 | |



Maximum Dry Density (Mg/m$^3$): 1.66 Optimum Moisture Content (%): 12

Description: Brown sandy, slightly gravelly, SILT

Sample Preparation: Material passing 20mm ~~Single~~ / Separate samples used

Particle Density (Mg/m$^3$): 2.65 Particle Density: Assumed

% retained on 20/37.5mm sieve: 0

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

| IGSL Materials Laboratory | Approved by | Date | Page |
|---|---|---|---|
| | H Byrne | 26/04/21 | 1 of 1 |

IGSL Ltd
Materials Laboratory
M7 Business Park
Naas
Co. Kildare

# Test Report

## Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No. R120657 Contract No. 23158

Contract Name: Curragh Farm , Ballymany , Newbridge,Co.Kildare

Lab Contract No. Location: SP02

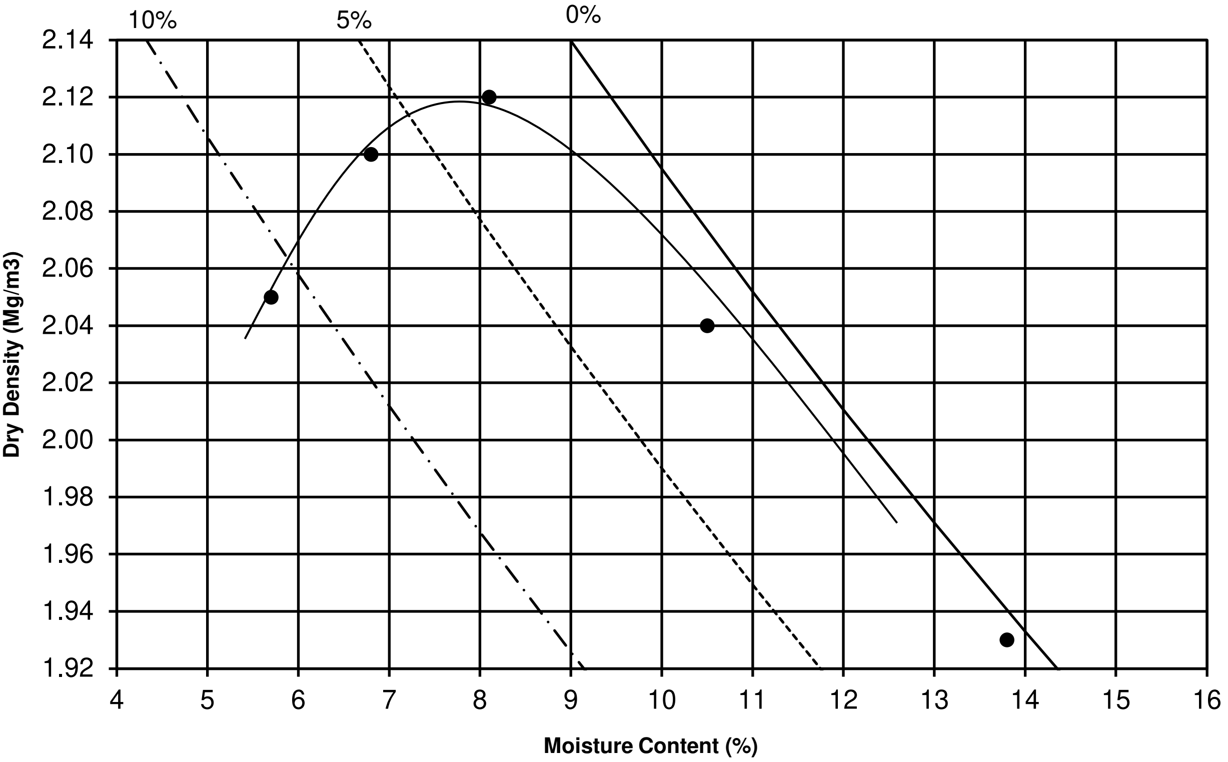
Sample No. AA157307-10 Depth (m) 0.90-1.00 Material Type B

Lab sample no. A21/1278 Customer: Neville Homes Ltd

Date Received: 18/03/2021 Test Method: 2.5 KG Rammer

Date Tested: 15/04/2021 BS1377:Part 4:1990 3.3

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dry Density (Mg/m$^3$) | 2.12 | 2.05 | 2.04 | 1.93 | 2.10 | 0.00 | |
| Moisture Content (%) | 8.1 | 5.7 | 11 | 14 | 6.8 | 0 | |



Maximum Dry Density (Mg/m$^3$): 2.12 Optimum Moisture Content (%): 8

Description: Brown slightly sandy, gravelly, SILT

Sample Preparation: Material passing 20mm ~~Single~~ / Separate samples used

Particle Density (Mg/m$^3$): 2.65 Particle Density: Assumed

% retained on 20/37.5mm sieve: 22

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

| IGSL Materials Laboratory | Approved by | Date | Page |
|---|---|---|---|
| | H Byrne | 22/04/21 | 1 of 1 |

# Appendix 4

## Chemical Analysis Records

2183

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

# Final Report

**Report No.:** 21-09825-1

**Initial Date of Issue:** 08-Apr-2021

**Client** IGSL

**Client Address:** M7 Business Park
Naas
County Kildare
Ireland

**Contact(s):** Darren Keogh

**Project** 23158 Curragh Farm, Ballymany, Newbridge

**Quotation No.:**

**Date Received:** 26-Mar-2021

**Order No.:**

**Date Instructed:** 26-Mar-2021

**No. of Samples:** 4

**Turnaround (Wkdays):** 7

**Results Due:** 07-Apr-2021

**Date Approved:** 08-Apr-2021

**Approved By:**

**Details:** Glynn Harvey, Technical Manager

# Results - Soil

**Project: 23158 Curragh Farm, Ballymany, Newbridge**

| **Client: IGSL** | **Chemtest Job No.:** | | | | 21-09825 | 21-09825 | 21-09825 | 21-09825 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: | **Chemtest Sample ID.:** | | | | 1167931 | 1167932 | 1167933 | 1167934 |
| Order No.: | Client Sample Ref.: | | | | 140482 | 140490 | 157301 | 145479 |
| | Sample Location: | | | | TP102 | TP103 | TP105 | TP107 |
| | Sample Type: | | | | SOIL | SOIL | SOIL | SOIL |
| | Top Depth (m): | | | | 0.5 | 0.9 | 0.5 | 0.5 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Moisture | N | 2030 | % | 0.020 | 18 | 19 | 17 | 9.4 |
| pH (2.5:1) | N | 2010 | | 4.0 | [A] 8.1 | [A] 7.8 | [A] 8.3 | [A] 9.0 |
| Magnesium (Water Soluble) | N | 2120 | g/l | 0.010 | [A] < 0.010 | [A] < 0.010 | [A] 0.011 | [A] 0.011 |
| Sulphate (2:1 Water Soluble) as SO4 | U | 2120 | g/l | 0.010 | [A] 0.041 | [A] 0.19 | [A] 0.10 | [A] 0.10 |
| Total Sulphur | U | 2175 | % | 0.010 | [A] < 0.010 | [A] 0.034 | [A] 0.023 | [A] 0.019 |
| Chloride (Water Soluble) | U | 2220 | g/l | 0.010 | [A] < 0.010 | [A] < 0.010 | [A] < 0.010 | [A] < 0.010 |
| Nitrate (Water Soluble) | N | 2220 | g/l | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Ammonium (Water Soluble) | U | 2120 | g/l | 0.01 | < 0.01 | 0.02 | < 0.01 | < 0.01 |
| Sulphate (Acid Soluble) | U | 2430 | % | 0.010 | [A] < 0.010 | [A] 0.049 | [A] 0.017 | [A] 0.014 |

# Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample: | Sample Ref: | Sample ID: | Sample Location: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|---|
| 1167931 | 140482 | | TP102 | | A | Amber Glass 250ml |
| 1167931 | 140482 | | TP102 | | A | Plastic Tub 500g |
| 1167932 | 140490 | | TP103 | | A | Amber Glass 250ml |
| 1167932 | 140490 | | TP103 | | A | Plastic Tub 500g |
| 1167933 | 157301 | | TP105 | | A | Amber Glass 250ml |
| 1167933 | 157301 | | TP105 | | A | Plastic Tub 500g |
| 1167934 | 145479 | | TP107 | | A | Amber Glass 250ml |
| 1167934 | 145479 | | TP107 | | A | Plastic Tub 500g |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 2010 | pH Value of Soils | pH | pH Meter |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 2040 | Soil Description(Requirement of MCERTS) | Soil description | As received soil is described based upon BS5930 |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium | Boron; Sulphate; Magnesium; Chromium | Aqueous extraction / ICP-OES |
| 2175 | Total Sulphur in Soils | Total Sulphur | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser. |
| 2220 | Water soluble Chloride in Soils | Chloride | Aqueous extraction and measuremernt by ‘Aquakem 600’ Discrete Analyser using ferric nitrate / mercuric thiocyanate. |
| 2430 | Total Sulphate in soils | Total Sulphate | Acid digestion followed by determination of sulphate in extract by ICP-OES. |

# Report Information

| Key | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |
| SOP | Standard operating procedure |
| LOD | Limit of detection |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

**Sample Deviation Codes**

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

**Sample Retention and Disposal**

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

# Appendix 5

# Exploratory Hole Location Plan

# Curragh Manor, Ballymany

Exploratory Hole Location Plan - Dwg 1 of 2

# Curragh Manor, Ballymany

Exploratory Hole Location Plan - Dwg 2 of 2


N
LEGEND
102.35 PROPOSED ROAD LEVELS
101.50 EXISTING GROUND LEVELS
101.5 EXISTING GROUND LEVELS

# Appendix 6.2 Outline Construction Management Plan

# OUTLINE CONSTRUCTION MANAGEMENT PLAN

for

# A PROPOSED STRATEGIC HOUSING DEVELOPMENT

at

# BALLYMANY ROAD, NEWBRIDGE, CO. KILDARE

for

# BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED

**Muir Associates Limited**,
Consulting Engineers,
Project Managers,
Marketing Network House,
Argyle Square,
Morehampton Road,
Dublin 4, D04 K0Y1

Tel: +353-1-6762788
Email: info@muir.ie
www.muir.ie

MUIR

## DOCUMENT HISTORY

## Job Ref: D1920

| Date | Revision | Prepared | Approved | Issue |
|---|---|---|---|---|
| 05.05.2021 | A | SS/SOR | SOR | Draft Issue |
| 14.05.2021 | B | SS/SOR | SOR | Planning Issue |
| 01.02.2022 | C | SS/SOR | SOR | Reissued for Planning |
| | | | | |
| | | | | |
| | | | | |

This report has been prepared on behalf of Briargate Developments Newbridge Limited in accordance with the terms and conditions of the related appointment.

Opinions and information provided in this report are on the basis of Muir Associates Limited using due skill, care and diligence and no warranty is provided as to their accuracy.

No part of this report may be copied or reproduced by any means without prior written permission from Muir Associates Limited.

It is expressly stated that no independent verification of any of the documents or information supplied to Muir Associates Limited has been made.

## CONTENTS

# 1.0 INTRODUCTION

This Plan has been prepared by Muir Associates Limited (MAL) to accompany a planning application for a Strategic Housing Development at Ballymany Road, Newbridge, Co. Kildare.

This Outline Construction Management Plan sets out a framework of measures to address the implications of the construction works. The Contractor appointed to undertake the works will be required to develop this framework document as part of their overall Construction Management Plan in line with their obligations under the Safety, Health and Welfare at Work (Construction) Regulations 2013.

## 2.0 LOCATION OF THE PROPOSED DEVELOPMENT

The proposed development is located on a site to the northwest of the R445 Ballymany Road in Newbridge, Co Kildare.

The existing ground levels on the subject site vary from approximately 107.0mAOD in the south east of the site to 95.0mAOD in the north west of the site. Some significant earthworks were previously undertaken on the site which has reduced a substantial portion of the site to formation level. Some stockpiles from this initial earthmoving exercise remain on the site.

Figure 2.1 presented below indicates the location of the proposed development site.

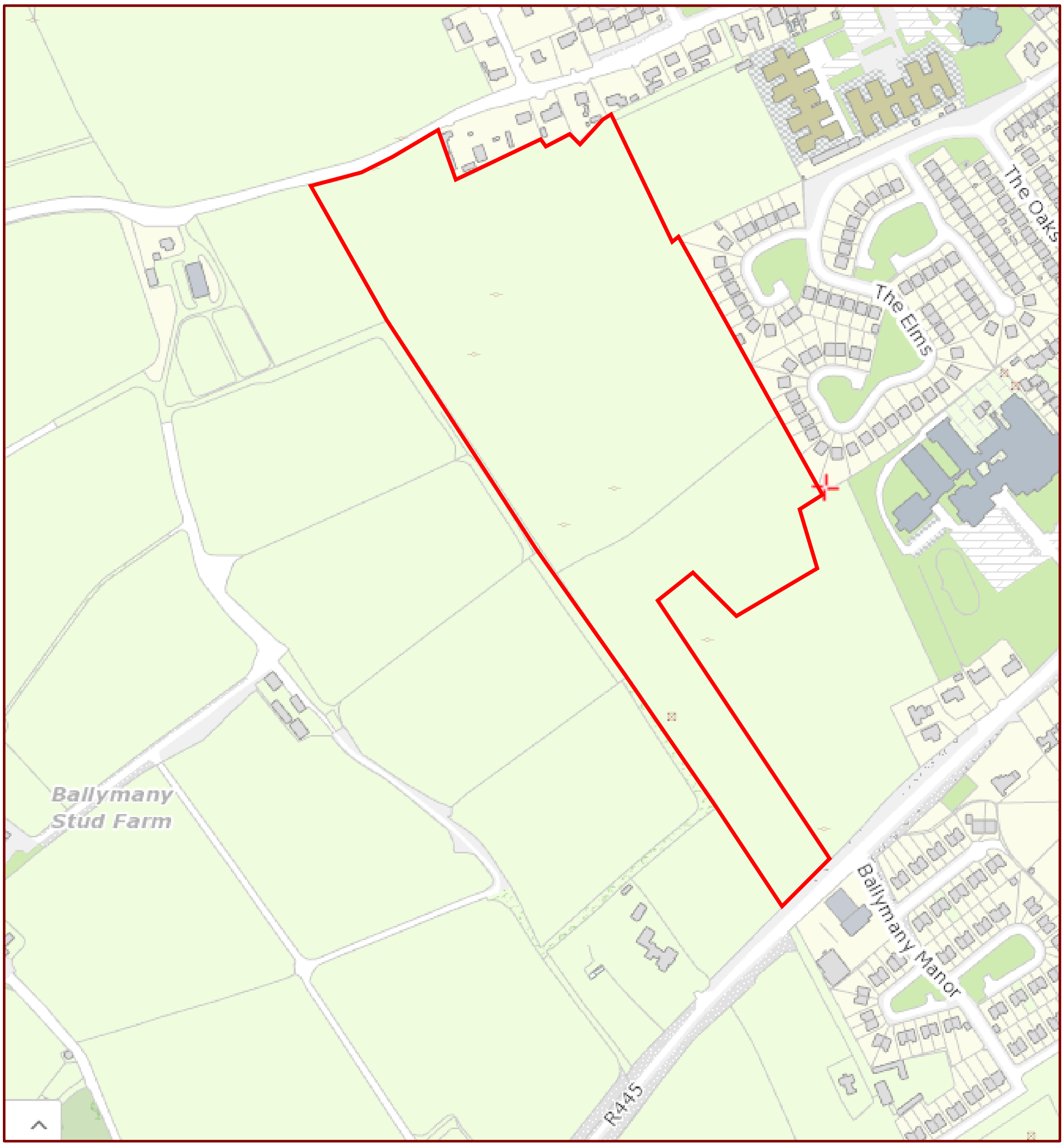


**Figure 2.1: Site Location Map;**

## 3.0 WORKS EXTENTS

The anticipated works extents will be contained within the "red line" site area indicated on the architect's drawings.

## 4.0 OUTLINE CONSTRUCTION MANAGEMENT PLAN

The Strategic Housing development with creche, served by a Link Road will consist of the following:

- Construction of 336 No residential units consisting of 245 No houses, 27 No apartments and 64 No duplex units;
- The 245 No houses will comprise 2-storey, detached, semi-detached and terraced units to include:
    - 17 no. 2-bed houses;
    - 184 no. 3-bed houses;
    - 44 no. 4-bed houses;
- The 27 No apartments are located in a part 3-storey and part 4-storey building and include:
    - 13 No 1-bed units;
    - 13 No 2-bed units;
    - 1 No 3-bed unit;
- The 64 no. duplexes are located across 6 no. 2 to 3-storey buildings and include:
    - 32 No 1-bed units;
    - 16 No 2-bed units;
    - 16 No 3-bed units;
- A 2-storey creche;
- Car parking, bicycle parking, internal roads, services infrastructure, bin stores and bicycle stores;
- Footpath improvements along Standhouse Road;
- Landscaping, play areas, boundary treatment and public lighting;
- All associated site works and services.

A full development description is provided in the planning report which accompanies the planning application.

### 4.1 Construction Programme and Phasing

Subject to a successful grant of planning permission, it is intended that the works will commence in early 2022. The proposed development is anticipated to be constructed over a period of 36 months.

The proposed development is likely to be constructed in a number of phases with each phase constructed in the following sequence:

- Set up site perimeter hoarding, maintaining existing pedestrian and traffic routes around the site;
- Site clearance and services diversions;
- Construction of internal road network, related underground services, and connections to existing services;
- Construction of substructures;
- Construction of the building superstructures;
- Completion of road network;
- Public lighting installation;
- External hard and soft landscaping;
- Demobilisation;

## 4.2 Vehicular Access to Site

It is anticipated that for the duration of the works all access and egress to the site for construction related activities will be via either Ballymany Road or Standhouse Road.

Security personnel will be present at the entrance/exit of the site to ensure all exiting traffic will do so safely.

A wheel wash will be installed at the exit from the site to prevent any dirt being carried onto the public road and a road sweeper will be used to clean public roads in the immediate vicinity of the site when necessary.

## 4.3 Protection of Public Areas from Construction Activity

Fencing will be erected around the perimeter of the site to prevent unauthorised access to the construction site. Controlled access points to the site, in the form of gates or doors/turnstiles, will be kept locked outside working hours. The Fencing will be maintained and will contain graphic images of the completed project.

All materials being lifted by crane will be controlled by guide ropes and such lifts will only be carried out under the strict supervision of appropriately qualified and experienced banksmen. Cranes will be fitted with restrictors to prevent lifting of materials over existing buildings in the vicinity of the site. Method statements will be prepared by the contractor where any plant is operating adjacent to existing buildings.

## 4.4 Site Security

The site fencing may incorporate branding using the appointed Contractors logos and marketing images. Information boards may also be placed on the hoarding.

Access to the site will be controlled during working hours, a gateman will control traffic movements and deliveries to ensure safe access and egress to the site.

All personnel working on site will be required to have a valid Safe Pass card and will be inducted by the Main Contractor with regard to site specific safety information.

## 4.5 Material Hoisting and Movement Throughout the Site

The majority of material handling on site during construction will be via the use of material hoists and teleporters. In addition, separate mobile crane visits may be required from time to time to accommodate the erection of heavy prefabricated elements (such as prefabricated timber roof trusses). These visits will be coordinated with the other site activities to ensure all risks are appropriately assessed and any necessary mitigation measures implemented.

## 4.6 Consents and Licences

All necessary statutory consents and licences required to commence on-site construction activities will be obtained in advance of the works commencing on site, subject to the appropriate notice period(s). These will include, but are not limited to the following:

- Site notices;
- Construction commencement notices required by Building Control;
- Connections to existing utilities and sewers;
- Road opening licences;

## 4.7 Deliveries and Storage Facilities

It is proposed that material deliveries to the site will be accommodated within the perimeter fencing. Such locations will be accessible by forklifts. Designated storage zones will be used to separate and segregate materials.

All deliveries to site will be scheduled to ensure their timely arrival and avoid the need for storing large quantities of materials on site. Deliveries will be scheduled to avoid peak hours so as, insofar as possible, avoid disturbance to pedestrian and vehicular traffic in the vicinity of the site.

## 4.8 Site Accommodation

On site accommodation will consist of the following:

- Adequate materials drop-off and storage area;
- Staff welfare facilities (canteen, toilets, site offices etc);

A temporary electricity supply will be provided to the site from the existing local electricity supply network.

Water supply to the site will be provided by means of a temporary connection to the public water main. A temporary connection for foul water drainage will be made to the public network in agreement with the Local Authority and Irish Water. If feasible an existing branch connection will be utilised.

### 4.9 Site Working Hours

There are no set times in law limiting the working hours on construction sites. It is proposed that construction activities on the site will generally be confined to between the hours of 0700 and 1900, Monday to Friday, and 0800 to 1400 on Saturdays.

However, it may be necessary for some construction activities to be undertaken outside these times (e.g., service diversions and connections). Where such activities arise, they will be agreed with the necessary parties prior to commencement of the related works.

Deliveries of materials to site will generally take place during working hours. However, there may be occasions where it is necessary to make certain deliveries outside these times (e.g., where large loads are limited to road usage outside peak times).

## 5.0 METHODOLOGY AND SEQUENCE OF WORKS

The construction of the development will involve conventional construction methodologies and thus will require the use of typical construction plant and vehicles. The anticipated phasing of construction will be generally as follows:

### Site Setup

- Establishing site hoarding, offices, and compounds;
- Welfare connections;

### Building Works

- Construction of building foundations;
- Construction of superstructure;
- Building fit out;

### Site Works

- Bulk Earthworks;
- Utilities installation;

- Road pavements;
- Boundary treatments;
- Soft landscaping;
- Public lighting installation;
- Hard landscaping including surface finishes;

### Sequence

The anticipated sequence of construction will be as follows:

- Site set up;
- Road construction;
- Building works;
- External site finishing works;

The above phasing and sequence are indicative. In practice, the actual approach taken by the Contractor will be subject to the following:

- Contractors' standard works methodology;
- Weather;
- Time of Year;
- Resources;
- Subcontractors;
- Lead in time for materials;

It is worth noting that the type of plant and machinery to be used and the methodologies to be adopted for the works will take cognisance of the various site constraints and this, in turn, is likely to impact on the phasing of the works and on the construction programme.

## 6.0 ENVIRONMENTAL ISSUES

### 6.1 Noise and Vibration

There are no published Irish regulations or guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and may also impose limits on noise at their discretion.

It is proposed that noise and vibration monitoring will be established on site throughout the project. Monitoring will be carried out prior to any works commencing on site in order to establish baseline data and the results of the monitoring will be issued to the Planning Authority on a regular basis.

All construction activities will be carried out in accordance with the relevant recommendations of ***BS 5228 Code of practice for noise and vibration control on construction and open sites***. The measures adopted to ensure compliance will include the following:

- Monitoring stations, which will be monitored daily, located on site and at recommended locations in the vicinity of the site to record background and construction noise activity;
- Proper maintenance of all operating plant to ensure noise emission compliance;
- All operating plant will be selected on the basis of incorporating noise reducing systems, and at a minimum be fitted with effective exhaust silencers;
- Plant such as pumps and generators which are required to work outside of normal working hours will be enclosed with acoustic enclosures;
- There will be strict adherence to the site working hours stipulated within this document or as amended by the planning permission conditions;

The construction works will also follow the guidelines and recommendations given in ***Best Practice Guidelines on the Preparation of Waste Management Plans for*** Construction ***and Demolition Projects*** published in July 2006 by the Department of the Environment, Heritage and Local Government.

## 6.2 Air Quality Monitoring

Appropriate air quality and dust monitoring will be carried out on a regular basis in accordance with any related planning conditions and records will be kept of all such monitoring for review by the Planning Authority.

## 6.3 Dust Control

The contractor will ensure that all construction vehicles that exit the site onto the public roads will not transport dust and dirt onto the external road network. This will be achieved through a combination of the following measures:

- Provision will be made for cleaning by a road sweeper of all access routes to and from the site during the course of the works. Road cleaning will be undertaken as required during the works. Exposed stockpiled demolition debris, crushed material, excavated materials, disturbed ground surfaces, and unpaved traffic areas will be maintained in a moist condition;
- During non-working hours, the site will be left in a condition that will prevent dust from being generated. At the end of each workday, disturbed areas will be wetted down, and security fencing will be installed and/or inspected to prevent access and additional disturbance.
- Ensuring all construction vehicles are inspected by the gateman for cleanliness prior to exiting the site;

- Ensuring an appropriate wheel or road washing facility is provided as and when required throughout the various stages of construction on site;

The use of appropriate water-based dust suppression systems will be adopted. This system will be closely monitored by site management personnel particularly during extended dry periods.

All external road gullies potentially impacted by the works will be surveyed in advance of the works and the condition recorded. Any deterioration of the gully's and their related performance during the works will be rectified immediately. Existing road markings potentially impacted by construction vehicles will be regularly monitored throughout the works and any deterioration promptly rectified in agreement with the Planning Authority.

## 6.4 Surface Water

The following is an outline of the procedures which will be implemented in relation to the protection of the existing surface water networks during the construction phase of the project. The details of the operational surface water disposal arrangements are given in the Engineering Report.

- Identify the location of all streams, watercourses, stormwater drains and drainage paths for surface water and how the proposed works will affect them by undertaking an appropriate pre-works survey (desk-based and on-site verification);
- A construction site drainage plan will be drawn up. Silt traps and settlement ponds will be established in appropriate locations of the site to treat run-off during construction prior to discharge. These will be inspected and maintained during construction;
- Run off from the construction site will be monitored;
- Designated impermeable concrete wash out areas will be established, maintained and the contents disposed of in an appropriate manner;
- All fuels and chemicals will be stored in bunded areas;
- Refuelling will take place in designated bunded areas;
- Identify potential sources of pollution;
- A method of disposing of contaminated water will be established in accordance with the requirements of the Environment Section of the Local Authority;
- In addition to the foregoing, the guidance provided in CIRIA C532 Control of Water Pollution from Construction Sites will be generally followed.

## 6.5 Excavations and Groundworks

All excavations and related groundworks will be undertaken using best practice methods and the following principles will be followed:

- Excavations will be kept to the minimum required taking cognisance of the construction methods and health and safety requirements;
- Construction equipment and support vehicles will travel only on designated roads and other approved access routes;
- Ground disturbance will be kept to a minimum;
- Material stockpiles will be stored in designated locations and soil stockpiles lightly compacted at the end of the working day;
- Surface water runoff from stockpiles will be intercepted via the construction site drainage plan to avoid direct discharge into the surface water system;

# 7.0 TRAFFIC MANAGEMENT

## 7.1 Access to the Site

It is anticipated that, following a successful grant of planning permission, construction works will commence in early 2022. Prior to the commencement of the works on site the contractor will prepare a detailed Construction Traffic Management Plan and agree its proposals with the Planning Authority and An Garda Síochána. It is proposed that construction traffic will access the site via either Ballymany Road or Standhouse Road.

## 7.2 Construction Parking

Given the location and nature of access to the site, site parking or construction parking will be located on the site. However, construction staff will be encouraged where available to use public transport and information on local transportation will be published on site. In addition, construction staff will be encouraged to car share.

## 7.3 Vehicle Movements During Construction

It is likely that the construction of the roadworks will result in the greatest number of construction vehicle movements during the whole of the construction period. The number of construction vehicle movements generated during this period has been estimated to peak at of order 8 two-way trips per hour. The construction traffic is not expected to significantly impact on the capacity of the surrounding road network. Construction vehicle movements will be minimised by the adoption of measures including:

- Consolidation of delivery loads to/from the site and managing large deliveries on site to occur outside of peak periods;
- Use of precast/prefabricated materials where possible;
- Provision of adequate storage space on the site;
- Development of a strategy to minimise construction material quantities insofar as possible;

- Construction staff vehicle movements will also be minimised by promoting, where feasible, the use of public transport and car sharing;

## 7.4 Public Roads

A visual condition survey will be undertaken of all surrounding public roads prior to the commencement of the works on site. The contractor will liaise with the Planning Authority to agree any changes to load restrictions and construction access routes for the site.

All entrances and temporary roads will be continuously maintained for emergency vehicle access. The following measures will be adopted to ensure that the site, public roads, and surrounding areas are kept safe and clean:

- A regular program of site cleaning will be established;
- Scaffolding will have debris netting attached to prevent materials and equipment being blown into public areas;
- Mud spillages on roads and footpaths outside the site will be cleaned regularly and will not be permitted to accumulate;
- Wheel wash facilities will be provided for vehicles exiting the site;

In the event of any waste escaping from the site, it will immediately be retrieved by the contractor.

## 7.5 Project Specific Traffic Management Plan

A detailed Project Specific Traffic Management Plan will be developed by the appointed contractor and agreed with the Planning Authority and An Garda Síochána prior to the commencement of the works on site. The traffic plan will be updated as required throughout the course of the project.

The issues to be addressed within the Project Specific Traffic Management Plan will include the following:

- Public safety
- Construction traffic routes
- Deliveries
- Traffic flows
- Signage and lighting
- Road opening licence requirements
- Road closures

The contractor will nominate an individual who will act as liaison with local stakeholders, the Planning Authority and An Garda Síochána.

## 8.0 CONCLUSIONS

It is worth noting that while this document sets out the requirements which are appropriate for the proposed development, any particular requirements will be added to the document as part of the normal evaluation of the works during the detailed design phase and in particular when considering appropriate management and controls to ensure that works is executed with minimal impact to others.

The Outline Construction Management Plan sets out the framework of measures to be developed by the Main Contractor as part of their obligation to properly manage the site and control all related activities that occur outside the site so that any related impact on people, property and the environment is reduced, insofar as possible, to an acceptable level.